This document is based on European standards and is not valid for use in U.S.A.

Compact / Hardwired / Logic Controller / M238
System User Guide

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Schneider Electric

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Important Information

NOTICE Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

CAUTION

CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result in** equipment damage.

PLEASE NOTE Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and the installation, and has received safety training to recognize and avoid the hazards involved

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Before You Begin

Do not use this product on machinery lacking effective point-of-operation guarding. Lack of effective point-of-operation guarding on a machine can result in serious injury to **the operator of that machine.**

⚠ WARNING

UNGUARDED MACHINERY CAN CAUSE SERIOUS INJURY

- Do not use this software and related automation products on equipment which does not have point-of-operation protection.
- Do not reach into machine during operation.

Failure to follow these instructions can cause death, serious injury or equipment damage.

This automation equipment and related software is used to control a variety of industrial processes. The type or model of automation equipment suitable for each application will vary depending on factors such as the control function required, degree of protection required, production methods, unusual conditions, government regulations, etc. In some applications, more than one processor may be required, as when backup redundancy is needed.

Only the user can be aware of all the conditions and factors present during setup, operation and maintenance of the machine; therefore, only the user can determine the automation equipment and the related safeties and interlocks which can be properly used. When selecting automation and control equipment and related software for a particular application, the user should refer to the applicable local and national standards and regulations. A "National Safety Council's" Accident Prevention Manual also provides much useful information.

In some applications, such as packaging machinery, additional operator protection such as point-of-operation guarding must be provided. This is necessary if the operator's hands and other parts of the body are free to enter the pinch points or other hazardous areas and serious injury can occur. Software products by itself cannot protect an operator from injury. For this reason the software cannot be substituted for or take the place of point-of-operation protection.

Ensure that appropriate safeties and mechanical/electrical interlocks for point-of-operation protection have been installed and are operational before placing the equipment into service. All mechanical/electrical interlocks and safeties for point-of-operation protection must be coordinated with the related automation equipment and software programming.

NOTE: Coordination of safeties and mechanical/electrical interlocks for point-of-operation protection is outside the scope of this document.

START UP AND TEST

Before using electrical control and automation equipment for regular operation after installation, the system should be given a start up test by qualified personnel to verify correct operation of the equipment. It is important that arrangements for such a check be made and that enough time is allowed to perform complete and satisfactory testing.

⚠ CAUTION

EQUIPMENT OPERATION HAZARD

- Verify that all installation and set up procedures have been completed.
- Before operational tests are performed, remove all blocks or other temporary holding means used for shipment from all component devices.
- Remove tools, meters and debris from equipment.

Failure to follow these instructions can result in injury or equipment damage.

Follow all start up tests recommended in the equipment documentation. Store all equipment documentation for future reference.

Software testing must be done in both simulated and real environments.

Verify that the completed system is free from all short circuits and grounds, except those grounds installed according to local regulations (according to the National Electrical Code in the U.S.A, for instance). If high-potential voltage testing is necessary, follow recommendations in equipment documentation to prevent accidental equipment damage.

Before energizing equipment:

- Remove tools, meters, and debris from equipment.
- Close the equipment enclosure door.
- Remove ground from incoming power lines.
- Perform all start-up tests recommended by the manufacturer.

OPERATION AND ADJUSTMENTS

The following precautions are from NEMA Standards Publication ICS 7.1-1995 (English version prevails):

- Regardless of the care exercised in the design and manufacture of equipment or in the selection and rating of components, there are hazards that can be encountered if such equipment is improperly operated.

- It is sometimes possible to misadjust the equipment and thus produce unsatisfactory or unsafe operation. Always use the manufacturer's instructions as a guide for functional adjustments. Personnel who have access to these adjustments should be familiar with the equipment manufacturer's instructions and the machinery used with the electrical equipment.

- Only those operational adjustments actually required by the operator should be accessible to the operator. Access to other controls should be restricted to prevent unauthorized changes in operating characteristics.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Only use software tools approved by Schneider Electric for use with this equipment.
- Update your application program every time you change the physical hardware configuration.

Failure to follow these instructions can cause death, serious injury or equipment damage.

Introduction

Introduction

This document is intended to provide a quick introduction to the described system. It is not intended to replace any specific product documentation, nor any of your own design documentation. On the contrary, it offers additional information to the product documentation, for installing, configuring and implementing the system.

The architecture described in this document is not a specific product in the normal commercial sense. It describes an example of how Schneider Electric and third-party components may be integrated to fulfill an industrial application.

A detailed functional description or the specification for a specific user application is not part of this document. Nevertheless, the document outlines some typical applications where the system might be implemented.

The architecture described in this document has been fully tested in our laboratories using all the specific references you will find in the component list near the end of this document. Of course, your specific application requirements may be different and will require additional and/or different components. In this case, you will have to adapt the information provided in this document to your particular needs. To do so, you will need to consult the specific product documentation of the components that you are substituting in this architecture. Pay particular attention in conforming to any safety information, different electrical requirements and normative standards that would apply to your adaptation.

It should be noted that there are some major components in the architecture described in this document that cannot be substituted without completely invalidating the architecture, descriptions, instructions, wiring diagrams and compatibility between the various software and hardware components specified herein. You must be aware of the consequences of component substitution in the architecture described in this document as substitutions may impair the compatibility and interoperability of software and hardware.

⚠ CAUTION

EQUIPMENT INCOMPATIBILITY OR INOPERABLE EQUIPMENT

Read and thoroughly understand all hardware and software documentation before attempting any component substitutions.

Failure to follow these instructions can result in injury or equipment damage.

Abbreviations

Abbreviation	Signification
AC	Alternating Current
CB	Circuit Breaker
CFC	Continuous Function Chart - a programming language based on function chart
DI	Digital Input
DO	Digital Output
DC	Direct Current
DFB	Derived Function Blocks
E-STOP	Emergency Stop
FBD	Function Block Diagram - an IEC-61131 programming language
HMI	Human Machine Interface
I/O	Input/Output
IL	Instruction List - a textual IEC-61131 programming language
LD	Ladder Diagram - a graphic IEC-61131 programming language
PC	Personal Computer
POU	Programmable Object Unit, Program Section in SoMachine
PS	Power Supply
RMS	Root Mean Square
RPM	Revolution Per Minute
SE	Schneider Electric
SFC	Sequential Function Chart - an IEC-61131 programming language
ST	Structured Text - an IEC-61131 programming language
TVDA	Tested, Validated and Documented Architecture
VSD	Variable Speed Drive
WxHxD	Dimensions: Width, Height and Depth

Glossary

Expression	Signification
Altivar (ATV)	SE product name for a family of VSDs
Harmony	SE product name for a family of switches and indicators
Lexium (LXM)	SE product name for a family of servo drives
Magelis	SE product name for a family of HMI devices
Modicon M238 Logic controller	SE product name for Logic Controller
Modbus	A Communications protocol
OsiSense	SE product name for a family of sensors
Phaseo	SE product name for a family of power supplies
Preventa	SE product name for a family of safety devices
SoMachine	SE product name for an integrated software tool
TeSys	SE product name for a family for motor protection devices and load contactors
Vijeo Designer	SE product name for Magelis HMI devices configuration software

Application Source Code

Introduction

The example source code is in the form of configuration, application and import files. Use the appropriate software tool to either open or import the files.

Extension	File Type	Software Tool Required
CSV	Comma Separated Values, Spreadsheet	MS Excel
DWG	Project file	AutoCAD
DOC	Document file	Microsoft Word
PDF	Portable Document Format - document	Adobe Acrobat
PROJECT	Project file	SoMachine
RTF	Rich Text File - document	Microsoft Word
VDZ	Project file	Vijeo Designer
ZW1	Project archive file	EPLAN P8

Typical Applications

Introduction

Here you will find a list of the typical applications and their market segments, where this system or subsystem can be applied:

Textile

- Opening and closing machines
- Circular knitting machines
- Plucking machines
- Blending machine
- Carding machines
- Drawing frame machines
- Combing machines
- Ring Spinning machines

Other Machines

- Wood working machines
- Cutting machines
- Sanding machines
- Sawing machines

SPECIAL NOTE
The products specified in this document have been tested under actual service conditions. Of course, your specific application requirements may be different from those assumed for this and any related examples described herein. In that case, you will have to adapt the information provided in this and other related documents to your particular needs. To do so, you will need to consult the specific product documentation of the hardware and/or software components that you may add or substitute for any examples specified in this documentation. Pay particular attention and conform to any safety information, different electrical requirements and normative standards that would apply to your adaptation.

The application examples and descriptions contained in this document have been developed based on products and standards available and defined for Europe. Some or all of the application examples may contain recommendations of products that are not available in your country or locality, or may recommend wiring, products, procedures or functions that are in conflict with your local, regional or national electrical or safety codes and/or normative standards.

⚠ WARNING

REGULATORY INCOMPATIBILITY

Be sure that all equipment applied and systems designed comply with all applicable local, regional and national regulations and standards.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

NOTE:
The information in this document is based on European standards and may not be valid for use in the U.S.A.

The use and application of the information contained herein require expertise in the design and programming of automated control systems. Only the user or integrator can be aware of all the conditions and factors present during installation and setup, operation, and maintenance of the machine or process, and can therefore determine the automation and associated equipment and the related safety provisions and interlocks which can be effectively and properly used. When selecting automation and control equipment, and any other related equipment or software, for a particular application, the user or integrator must also consider any applicable local, regional or national standards and/or regulations.

System

Introduction

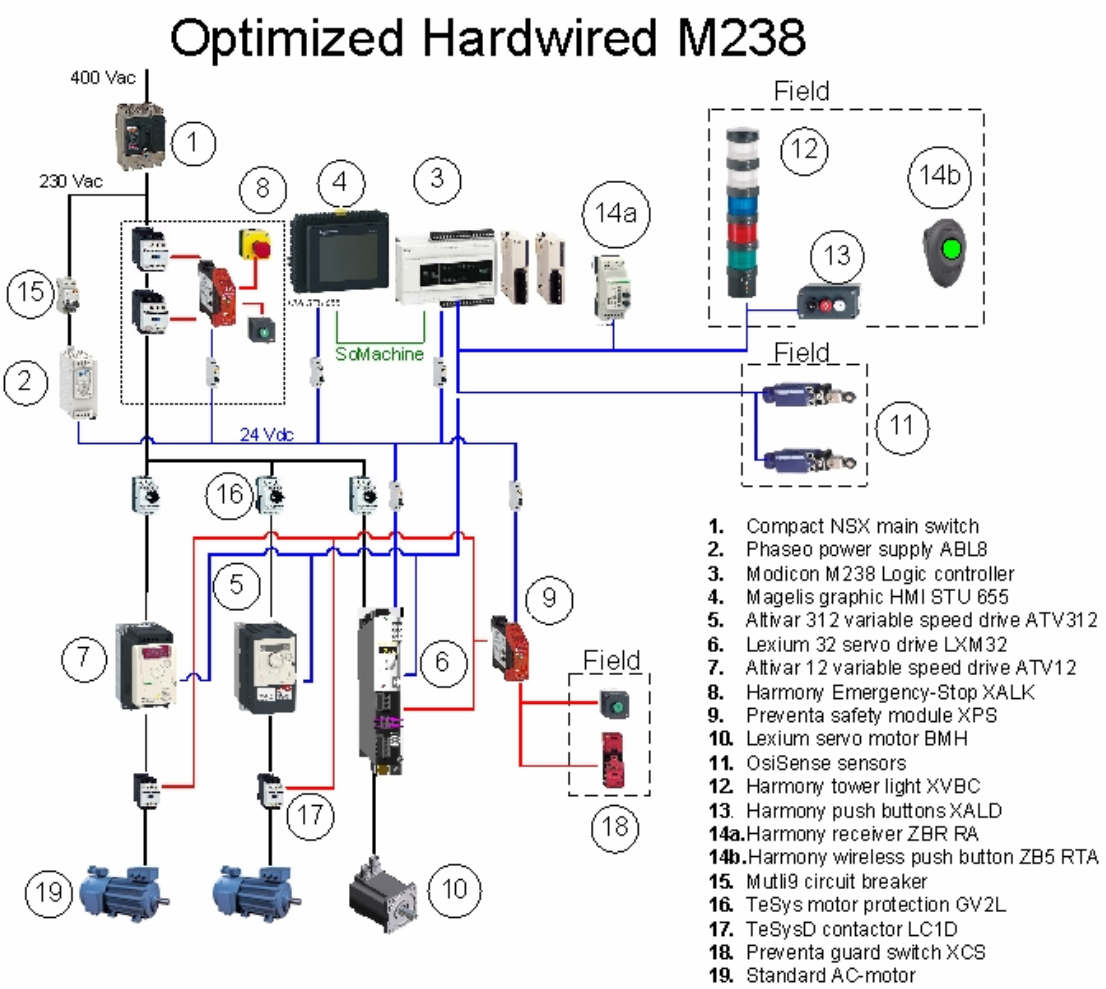
The system chapter describes the architecture, the dimensions, the quantities and different types of components used within this system.

Architecture

General

The controller in this application is a Modicon M238 Logic controller. The user can control and monitor the application using the Magelis HMI device. The motor drives, which are hardwired to the controller, are of the type Altivar 12, Altivar 312 and servo drive Lexium 32C. The example application includes two functional safety options according to EN ISO 13849-1 standards: an Emergency Stop function supervised by a Preventa Safety Module (see the appropriate hardware manual), plus a second Preventa Safety Module to evaluate protective door sensors.

Layout



1. Compact NSX main switch
2. Phaseo power supply ABL8
3. Modicon M238 Logic controller
4. Magelis graphic HMI STU 655
5. Altivar 312 variable speed drive ATV312
6. Lexium 32 servo drive LXM32
7. Altivar 12 variable speed drive ATV12
8. Harmony Emergency-Stop XALK
9. Preventa safety module XPS
10. Lexium servo motor BMH
11. OsiSense sensors
12. Harmony tower light XVBC
13. Harmony push buttons XALD
14a. Harmony receiver ZBR RA
14b. Harmony wireless push button ZB5 RTA
15. Mutli9 circuit breaker
16. TeSys motor protection GV2L
17. TeSysD contactor LC1D
18. Preventa guard switch XCS
19. Standard AC-motor

Components

Hardware:

- Compact NSX100F main switch
- Phaseo ABL8 power supply 230 Vac / 24 Vdc
- Modicon M238 Logic controller
- Magelis HMISTU655
- Motor circuit breaker GV2L (short circuit protected)
- TeSysD load contactors LC1D
- Altivar 12 and Altivar 312 variable speed drives
- Lexium 32C servo drive
- BMH servo motor
- Multi9 circuit breaker
- Emergency Stop switch with rotation release XALK
- Harmony illuminated pushbuttons XB5
- Harmony receiver ZBR RA
- Harmony wireless push button ZB5 RTA
- OsiSense limit switches
- Preventa guard switch
- Preventa safety module

Software:

- SoMachine V3.0

Quantities of Components

For a complete and detailed list of components, the quantities required and the order numbers, please refer to the components list at the end of this document.

Degree of Protection

Not all the components in this configuration are designed to withstand the same environmental conditions. Some components may need additional protection, in the form of housings, depending on the environment in which you intend to use them. For environmental details of the individual components please refer to the list in the appendix of this document and the appropriate user manual.

Cabinet Technical Data

Input	Mains voltage	400 Vac
	Power requirement	~ 3 kW
	Cable Size	5 x 2.5 mm² (L1, L2, L3, N, PE)
	Cable Connection	3 phase + Neutral + Ground Neutral is needed for 230 Vac (Phase and Neutral)
Output	Motor power ratings	1 asynchronous motor (4 poles:1500 RPM) controlled by ATV12 (0.37 kW) 1 asynchronous motor controlled by ATV312 (0.37 kW) 1 servo motor (BMH type without brake) controlled by LXM32C (continuous output current : 6 A RMS at 6000 RPM)

Functional Safety Notice

(EN ISO 13849-1 EN IEC 62061)

The standard and level of functional safety you apply to your application is determined by your system design and the overall extent to which your system may be a hazard to people and machinery.

Whether or not a specific functional safety category should be applied to your system should be ascertained with a proper risk analysis.

This document is not comprehensive for any systems using the given architecture and does not absolve users of their duty to uphold the functional safety requirements with respect to the equipment used in their systems or of compliance with either national or international safety laws and regulations

Emergency Stop

Emergency Stop/Emergency Disconnection function

This function for stopping in an emergency is a protective measure which compliments the safety functions for the safeguarding of hazardous zones according to prEN ISO 12100-2.

Safety Function

Door guarding

up to Performance Level (PL) = b, Safety Integrity Level (SIL) = 1

Dimensions

The dimensions of the individual devices used; controller, drive, power supply, etc. require a housing cabinet size of at least 1200 x 800 x 400 mm (WxHxD).

The HMI display, illuminated indicators such as “SYSTEM ON“, “SYSTEM OFF“ or “ACKNOWLEDGE EMERGENCY STOP“ as well as the Emergency Stop switch itself, can be built into the door of the cabinet.

Installation

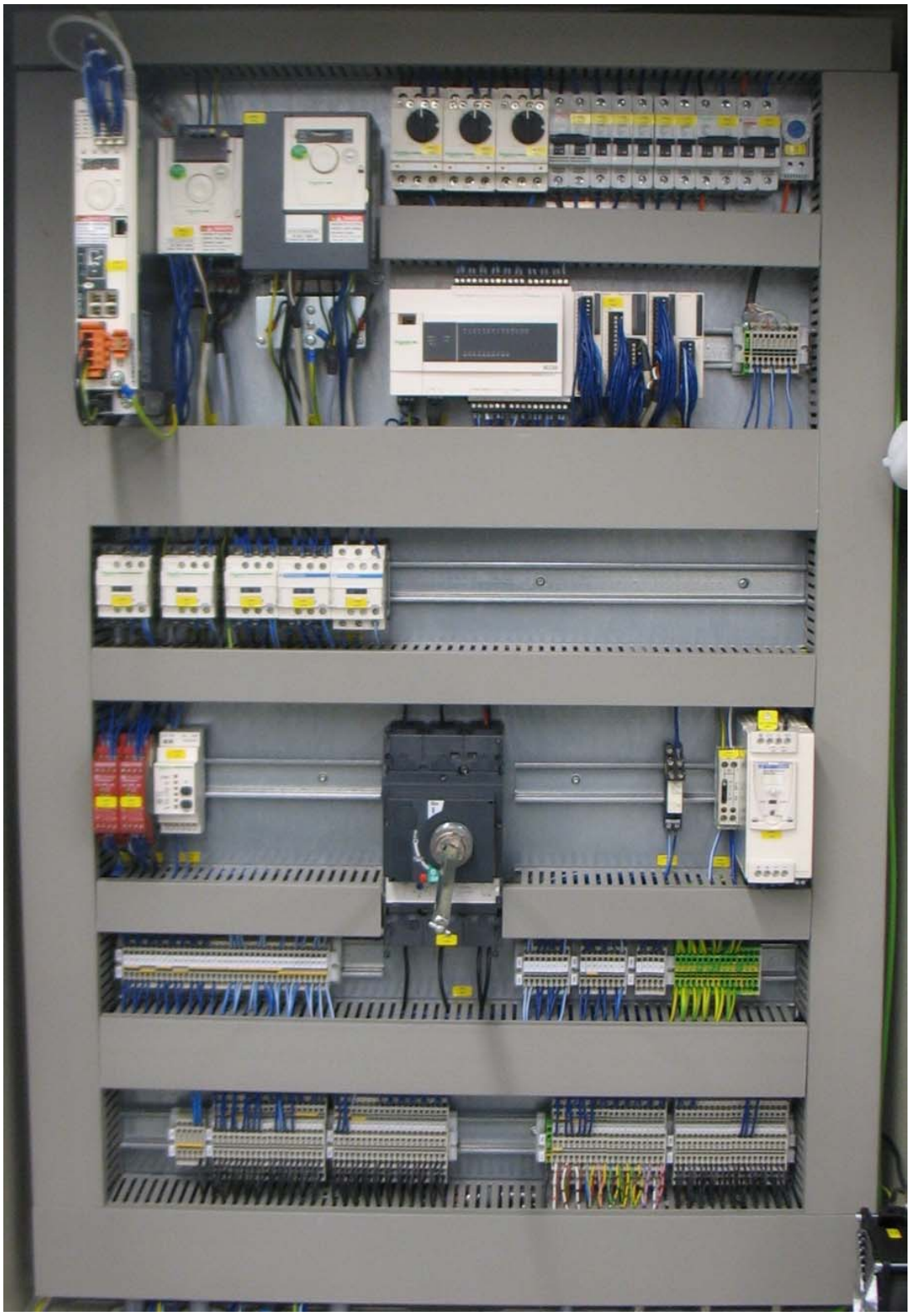
Introduction

This chapter describes the steps necessary to set up the hardware and configure the software required to fulfill the described function of the application.

Assembly

Main cabinet front

Main cabinet interior



Field devices and motors

Notes

The components designed for installation in a cabinet, i.e. the controller, safety module, circuit breakers, contactors, motor circuit breakers, power supply and TM2 I/O modules can be mounted on a 35 mm DIN rail.

Main switch, Lexium 32 servo drives and Altivar 12, Altivar 312 variable speed drives are screwed directly onto the mounting plate.

The Emergency Stop button, door guard switches and the pushbutton housing for the display and acknowledgement indicators are designed for on-wall mounting in the field. All switches (except the door guard switch) can also be installed directly inside a control cabinet (e.g., in a cabinet door) without special housings.

There are two options for installing XB5 pushbuttons or indicator lamps: These pushbuttons or switches can be installed either in a 22 mm hole, e.g., drilled into the front door of the control cabinet, or in an XALD-type housing suitable for up to 5 pushbuttons or indicator lamps. The XALD pushbutton housing is designed for backplane assembly or direct wall mounting.

The architecture includes a Harmony wireless push button ZB5 RTA and a Harmony receiver ZBR RA to switch a tower light.

The individual components must be interconnected in accordance with the detailed circuit diagram in order to ensure that they function correctly.

- 400 Vac 3-phase wiring between the main circuit breaker, the Altivar 312 drive and the motor.
- 230 Vac 1-phase wiring between the main circuit breaker and Altivar 12 drive and 3-phase wiring between the Altivar 12 drive and the motor.
- 230 Vac 1-phase wiring between the main circuit breaker and Lexium 32C drive.
- 230 Vac 1-phase wiring between the main circuit breaker and primary side of the 24 Vdc power supply.
- 24 Vdc wiring for control circuits and the controller, I/O modules and the HMI.

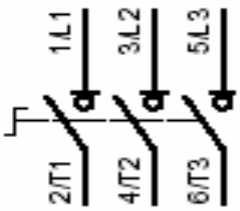
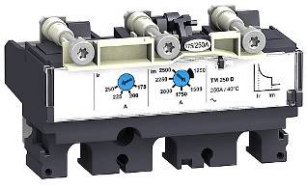
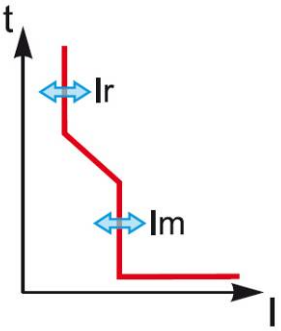
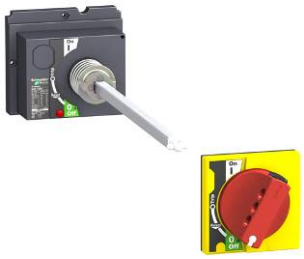
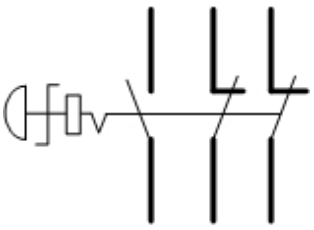
Serial Line VW3A8306R30 cable is installed for the communication link between the controller and the HMI.

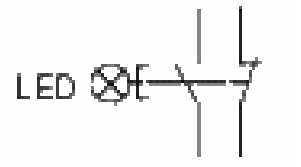
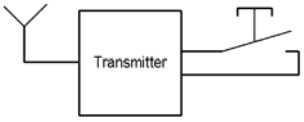
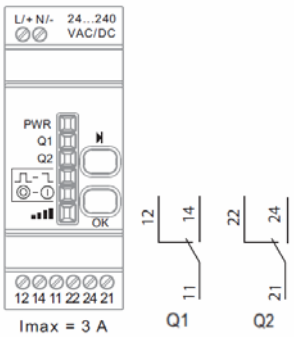
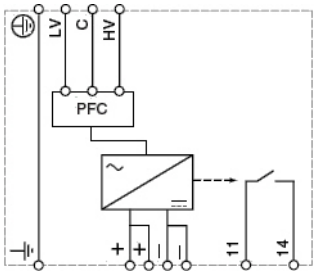
The modules and I/O listed here are a representative cross section of the modules and indicators required to implement the application as defined in this document and will without doubt differ from your own specific application.

Hardware

General

General description of the hardware, assembly instructions.

Main switch **Compact NSX100F** **LV429003** 36 kA 380/415 Vac		
Main Switch **Compact NSX100F** **LV429037** Trip unit TM16D Thermal-magnetic 16 A		 Ir - Thermal protection Im - Magnetic protection
Main Switch **Compact NSX100F** **Rotary handle** **LV429340** **Terminal shield** **LV429515**	 Rotary handle with red handle on yellow front	 Terminal shield short
Emergency Stop switch **Harmony** **XB5AS844 +** **XB5AZ141**	 	

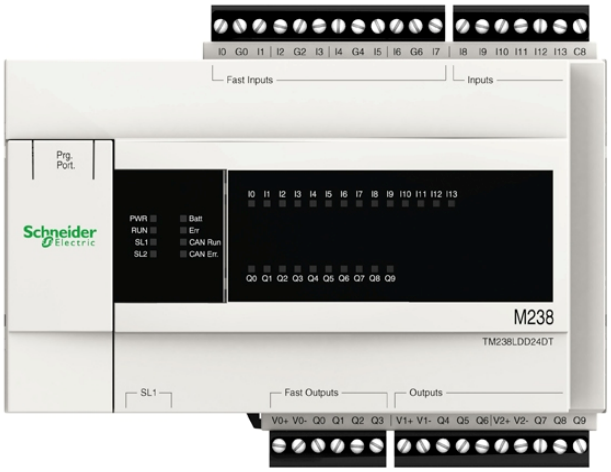
Push Button **Harmony** **with indicator lamp** **XB5**		
Wireless pushbutton transmitter **Harmony** **ZBRM01**		
Programmable Receiver for wireless pushbutton **Harmony** **ZBRRA**		
Power Supply **Phaseo** **ABL8RPS24050** Primary 200…500 Vac, Secondary 24 Vdc, 120 W, 5 A		

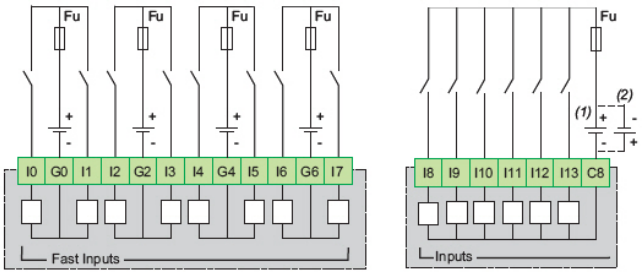
Controller

Modicon M238 Logic controller

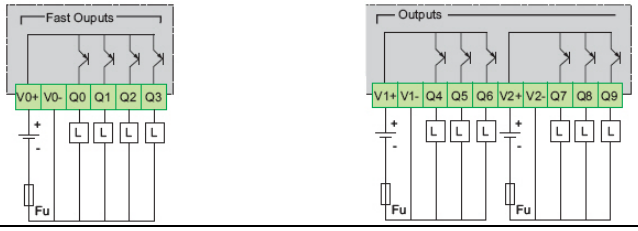
TM238LDD24DT

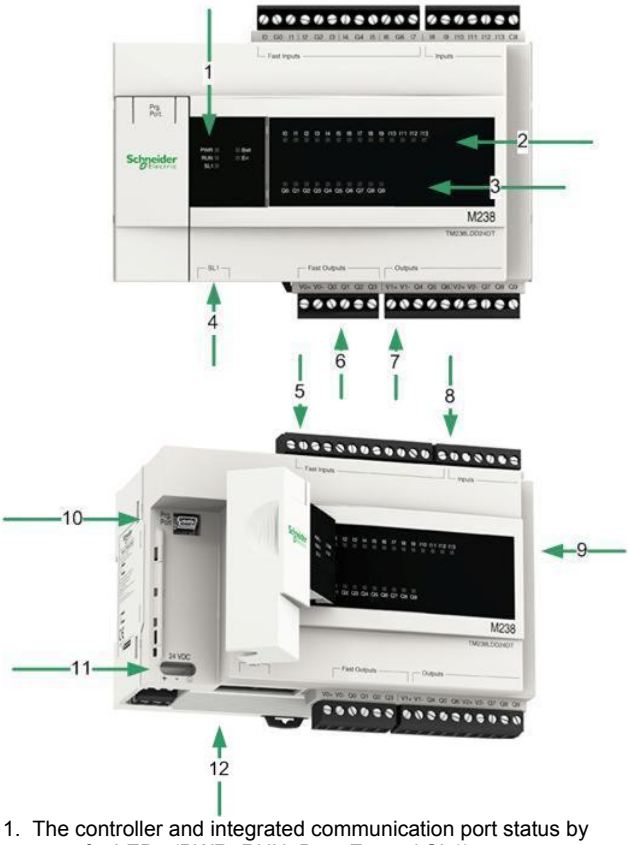
14 Digital Inputs
incl. 8 Fast Inputs,
10 Digital Outputs
incl. 4 Fast Outputs,

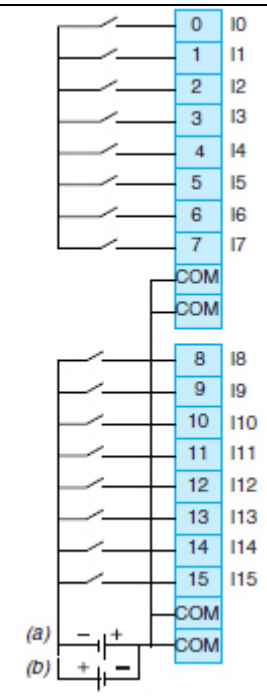
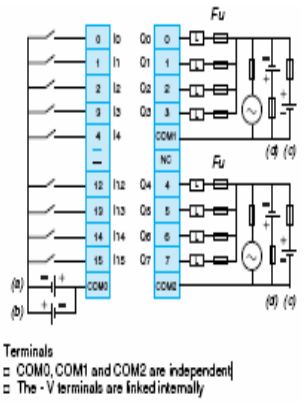


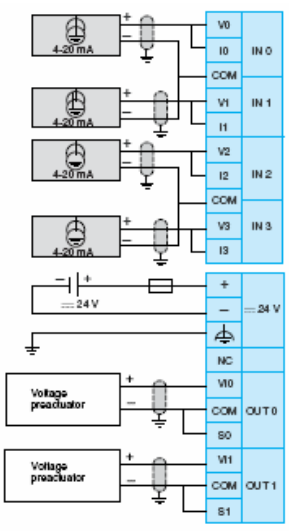
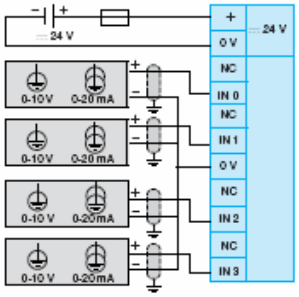
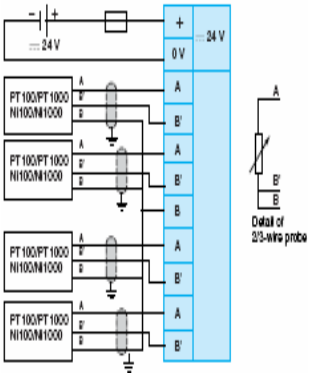


(1) Sink inputs (positive logic)
(2) Source inputs (negative logic)



Controller **Modicon M238** **Logic controller** **TM238LDD24DT**	 1. The controller and integrated communication port status by means of 5 LEDs (PWR, RUN, Batt, Err and SL1). 2 . A display unit showing the Input states (I0…I13). 3. A display unit showing the Output states (Q0…Q9). 4. RJ 45 connector for connection of a serial link marked SL1 (SoMachine protocol). 5. A removable screw terminal block (12 terminals) for connecting the sensors (24 Vdc fast inputs). 6. A removable screw terminal block (6 terminals) for connecting the 4 pre-actuators (24 Vdc fast outputs). 7. A removable screw terminal block (10 terminals) for connecting the 6 pre-actuators (24 V dc outputs). 8. A removable screw terminal block (7 terminals) for connecting the sensors (24 Vdc inputs). 9. A connector for extension modules, for example TWDNOI10M3 (7 modules max.). 10. Mini B USB Port, for a programming terminal. 11. A non-removable screw terminal block (3 terminals +, -, t marked 24 Vdc) for connecting the 24 Vdc power supply. With access from the underside of the controller: 12. A hinged cover for accessing the optional backup battery for the RAM memory and the real-time clock inside the base.

TM2 I/O Module **TM2DDI16DT** 16 Digital Inputs, 24 Vdc Sink/Source, Removable Screw Terminal Block		 **(a) Source inputs** **(b) Sink inputs**
TM2 I/O Module **TM2DMM24DRF** 16 Inputs, 24 Vdc 8 Relays Outputs, 24 Vdc Non-removable spring Terminal Block		

TM2 I/O Module **TM2AMM6HT** 4 Analog Inputs (0…10 Vdc / 4…20 mA) 2 Analog Outputs (0..10 Vdc / 4..20 mA)		
TM2 I/O Module **TM2AMI4LT** 4 Analog Inputs (0… 10 Vdc / 4… 20 mA) alternatively 4 Temperature Probes (Pt100 / Pt1000 / Ni100 / Ni1000)		Volt/Current Configuration  Temperature Probe Configuration 

HMI

Magelis

HMISTU655

24 Vdc Input, 3.5” colour TFT, 320 x 240 Pixels, 65536 Colors, 16 MB Application Flash EPROM with Built-in Ethernet

1 A removable screw terminal block for the 24 V c power supply

2 An RJ45 connector for RS 232C or RS 485 serial link connection to PLCs (COM1)

3 A USB type A host connector for:

- Connection of a peripheral device
- Connection of a USB memory stick
- Application transfer

4 A USB mini-B device connector for application transfer (on the left-hand side)

5 An RJ45 connector for the Ethernet TCP/IP 10BA SE-T/100BA SE-TX link

Motor Circuit Breaker

TeSys

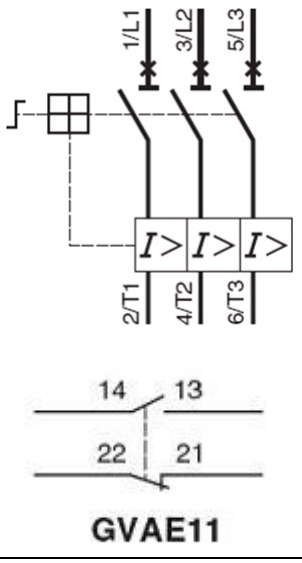
GV2L07

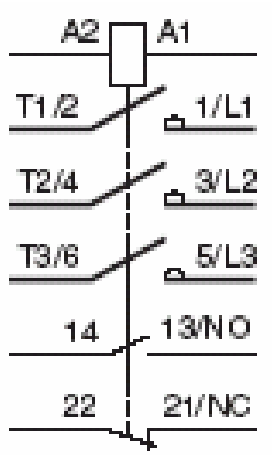
and

GV2L14

Used together with auxiliary contact

GVAE11



Circuit Breaker **Multi 9** **23726, 23747, 24518 and 26135**		
Contactor **TeSysD** **LC1D09BD**		

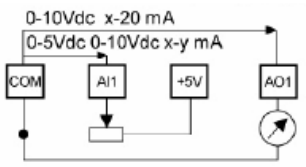
Variable Speed Drive

Altivar 12

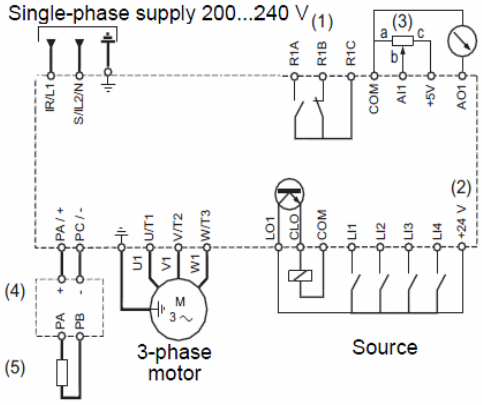
ATV12H037M2

1-phase

230 Vac, 0.37 kW



External 0…10 Vdc Analog Signal as Speed Reference



1. R1 relay contacts, for remote indication of the drive status.
2. Internal + 24 V c. If an external source is used (+ 30 V c maximum), connect the 0 V of the source to the COM terminal, and do not use the + 24 V c terminal on the drive.
3. Reference potentiometer SZ1RV1202 (2.2 kΩ) or similar (maximum 10 kΩ).
4. Optional braking module VW3A7005
5. Optional braking resistor VW3A7ppp or other acceptable resistor.

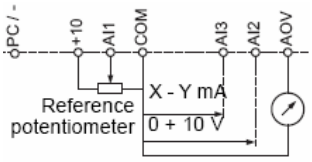
Variable Speed Drive

Altivar 312

ATV312H037N4

3-phase

400 Vac, 0.37 kW

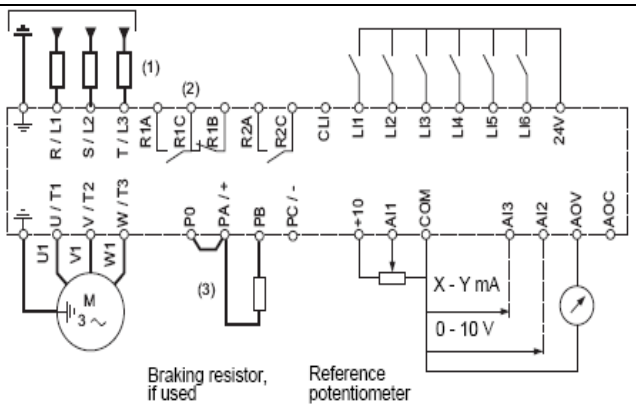


External 0…10 Vdc Analog Signal as Speed Reference

Variable Speed Drive

Altivar 312

ATV312H037N4



1. Line choke, if used
2. Detected fault relay contacts, for remote indication of the drive status
3. Braking resistor, if used

Variable Speed Drive

Altivar 312

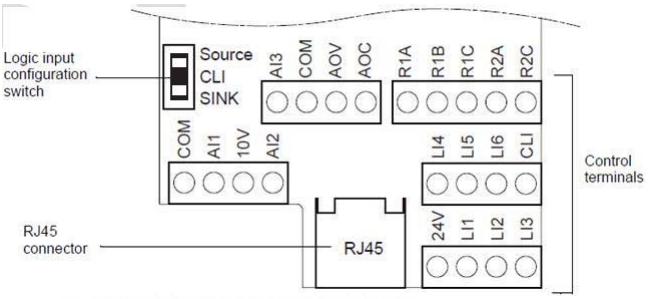
ATV312H037N4

Terminal connection

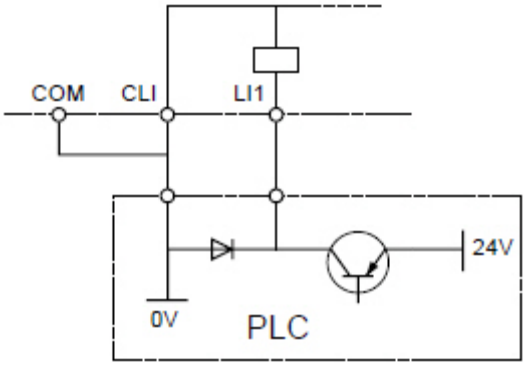
The following is mandatory to ensure that the logic inputs can be energized using M238 transistor outputs:

Toggle the logic input configuration switch to CLI position

Connect the CLI terminal to the 0 Vdc reference potential



- Switch in CLI position



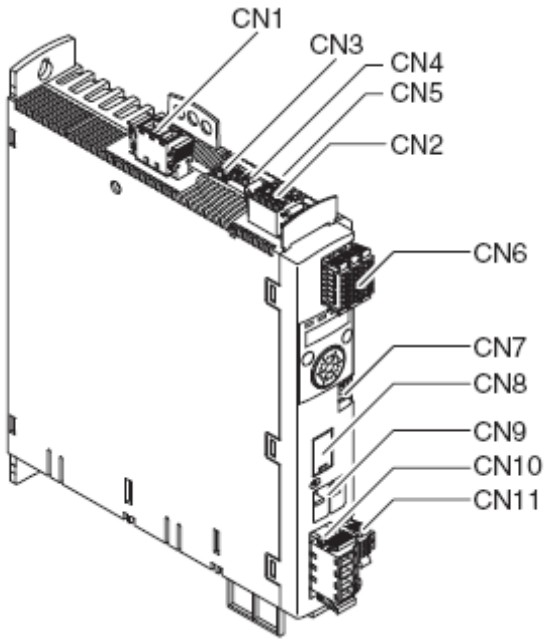
Servo Drive **Lexium 32C** **LXM32CD18M2** 1-phase 230 Vac, Continuous output current: 6 A RMS at 6000 RPM	
Servo Drive **Lexium 32C** **LXM32CD18M2** Embedded Human Machine Interface	

Servo Drive

Lexium 32C

LXM32CD18M2

Control Panel Overview of the Signal Connectors



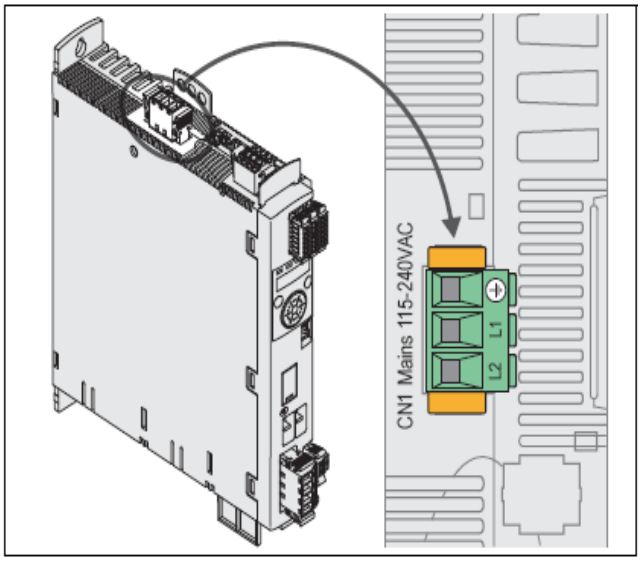
Connection	Assignment
CN1	Power stage supply voltage
CN2	24 controller supply voltage and STO safety function
CN3	Motor encoder (encoder 1)
CN4	PTO (encoder simulation ESIM)
CN5	PTI (pulse/direction, A/B, CW/CCW)
CN6	Analog inputs and digital inputs/outputs
CN7	Modbus (commissioning interface)
CN8	External braking resistor
CN9	DC bus connection for parallel operation
CN10	Motor phases
CN11	Holding brake

Servo Drive

Lexium 32C

LXM32CD18M2

Power Connection CN1



Servo Drive

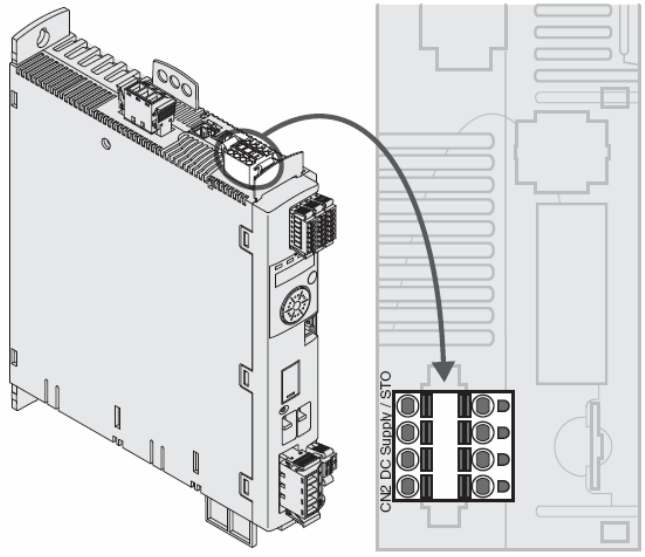
Lexium 32C

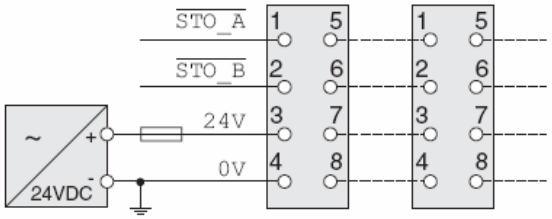
LXM32CD18M2

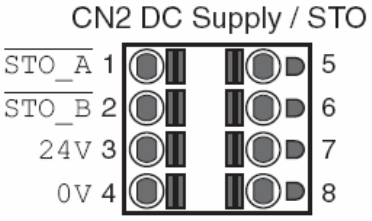
Connection to the controller supply Voltage and STO

CN2

The controller supply voltage (24 Vdc) must be connected for all operating modes







Pin	Signal	Meaning
1, 5	STO_A	Safety function STO: Dual-channel connection, connection A
2, 6	STO_B	Safety function STO: Dual-channel connection, connection B
3, 7	+24VDC	24 V controller supply voltage
4, 8	0VDC	Reference potential for 24 V controller supply voltage; Reference potential for STO

Servo Drive

Lexium 32C

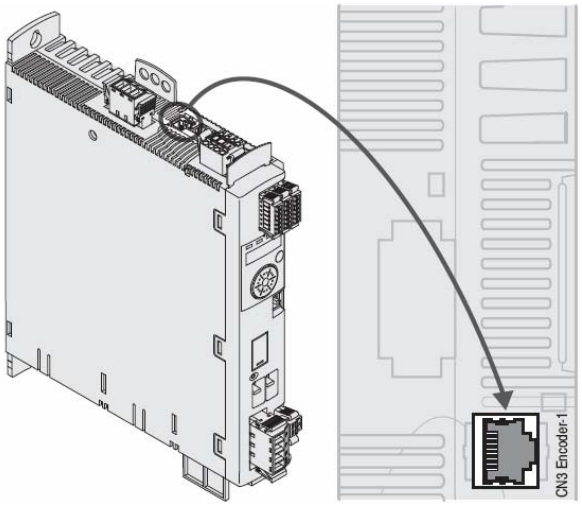
LXM32CD18M2

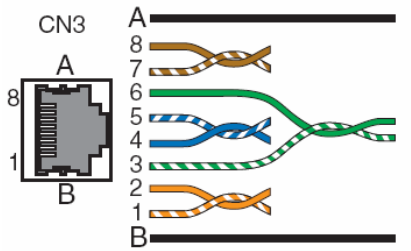
Signal Connector

CN3

A: Encoder Cable Connection to Motor (Length 3 m)

VW3M8101R30





Pin	Signal	Motor, pin	Pair	Meaning	I/O
1	COS+	9	2	Cosine signal	I
2	REFCOS	5	2	Reference for cosine signal	I
3	SIN+	8	3	Sine signal	I
6	REFSIN	4	3	Reference for sine signal	I
4	Data	6	1	Receive data, transmit data	I/O
5	$\overline{\text{Data}}$	7	1	Receive data and transmit data, inverted	I/O
7	reserved		4	Not assigned	
8	reserved		4	Not assigned	
A	ENC+10V_OUT	10	5	Encoder supply	O
B	ENC_0V	11	5	Reference potential for encoder supply	
	SHLD			Shield	

Servo Drive

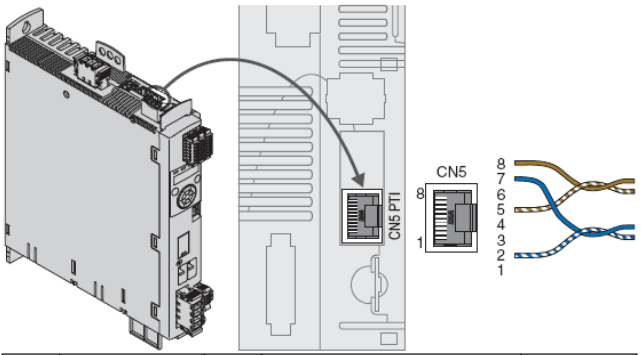
Lexium 32C

LXM32CD18M2

Signal Connector

CN5

(PTO-Channel)



Pin	Signal	Pair	Meaning	I/O
7	PULSE(24)	A	Pulse 24V	I (24 V)
2	$\overline{\text{PULSE}}$	A	Pulse, inverted	I (24 V)
8	DIR(24)	B	Direction 24V	I (24 V)
5	$\overline{\text{DIR}}$	B	Direction, inverted	I (24 V)

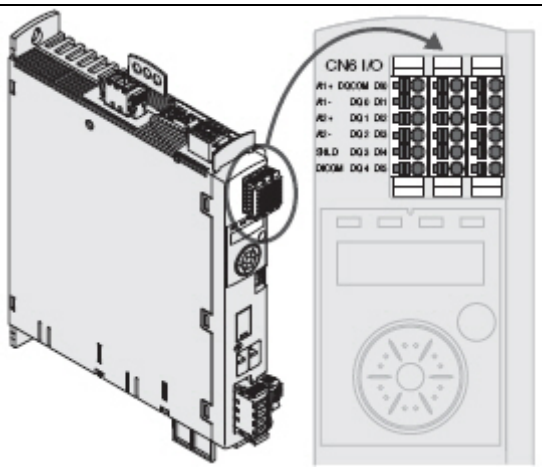
Servo Drive

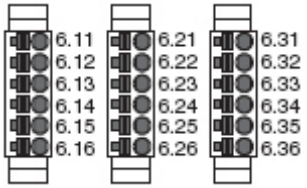
Lexium 32C

LXM32CD18M2

Wiring diagram, digital inputs/outputs

CN6



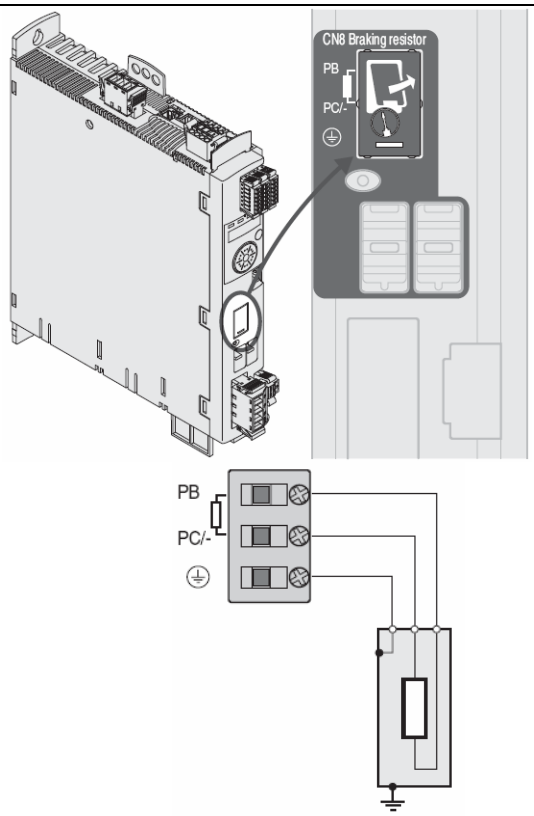
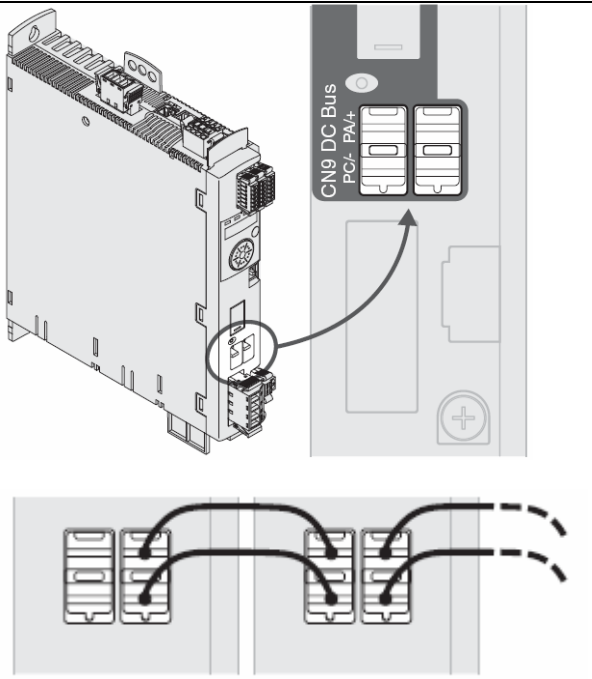


Pin	Signal	1)	Meaning
6.11	AI1+		Analog input 1, ±10V, for example, for reference value current or reference value speed of rotation
6.12	AI1-		Reference potential to AI1+, pin 1
6.13	AI2+		Analog input 2, ±10V, for example for current limitation or speed limitation
6.14	AI2-		Reference potential to AI2+, pin 3
6.15	SHLD		Shield connection
6.16	DI_COM	X	Reference potential to DI0 ... DI5 at CN6.31 ... CN6.36

Pin	Signal	1)	Meaning
CN6.21	DQ_COM		Reference potential digital outputs
CN6.22	DQ0		Digital output 0
CN6.23	DQ1		Digital output 1
CN6.24	DQ2		Digital output 2
CN6.25	DQ3	X	Digital output 3
CN6.26	DQ4		Digital output 4

Pin	Signal	1)	Meaning
CN6.31	DI0		Digital input 0
CN6.32	DI1		Digital input 1
CN6.33	DI2		Digital input 2
CN6.34	DI3	X	Digital input 3
CN6.35	DI4		Digital input 4
CN6.36	DI5		Digital input 5

Pin	Signal		Meaning
	DI_COM		Reference potential digital inputs: CN6.14

Servo Drive **Lexium 32C** **LXM32CD18M2** Connecting the external braking resistor CN8	
Servo Drive **Lexium 32C** **LXM32CD18M2** Parallel connection of DC bus. CN9	

Servo Drive

Lexium 32C

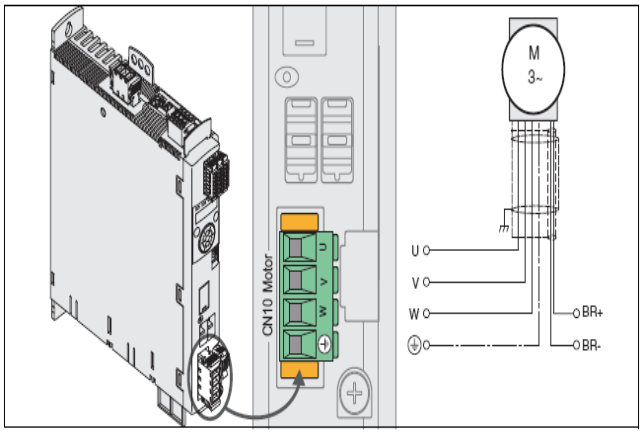
LXM32CD18M2

Motor Connection

CN10

Power Cable Connection to Motor (Length 3 m)

VW3M5101R30



Connection	Meaning	Color
U	Motor phase	Black L1 (BK)
V	Motor phase	Black L2 (BK)
W	Motor phase	Black L3 (BK)
PE	Protective ground conductor	Green/yellow (GN/YE)
BR+	Holding brake +	White (WH)
BR-	Holding brake -	Gray (GR)

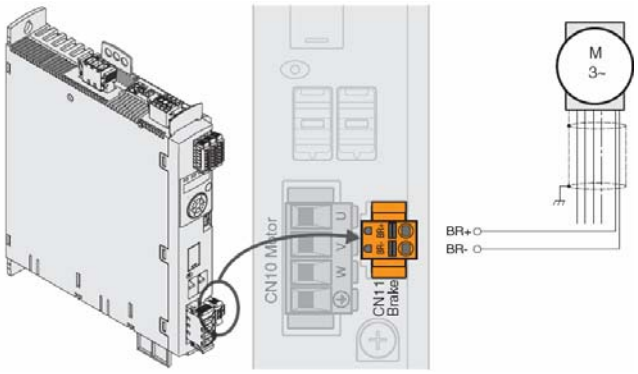
Servo Drive

Lexium 32C

LXM32CD18M2

Wiring diagram holding brake

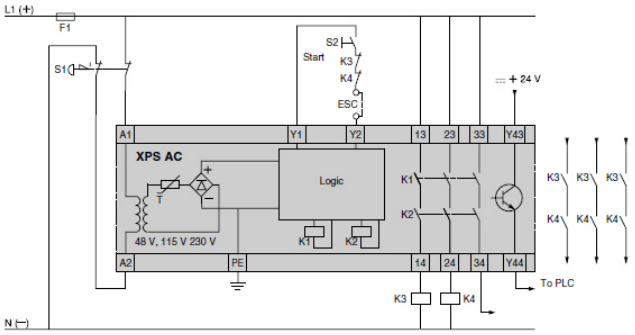
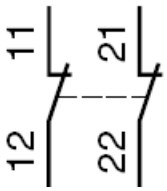
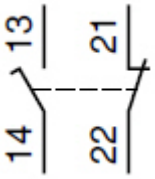
CN11

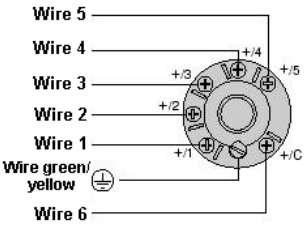


Servo Motor

BMH0702T06A2A

Connected to Motor Terminals and CN3 of LXM32 using the cables VW3M5101R30 and VW3M8101R30 respectively.

Safety Module **Preventa** **XPSAC5121**		
		
Guard Switch **Preventa** **XCSPA792**		
Limit Switch **OsiSense** **XCKP2118P16**		

Tower Light **Harmony** **XVBC21** CONNECTION ELEMENT **XVBC33** SIGNAL ELEMENT GREEN **XVBC34** SIGNAL ELEMENT RED **XVBC36** SIGNAL ELEMENT BLUE **XVBC37** SIGNAL ELEMENT CLAER **XVPC34 RED LENS** **XVPC36 BLUE LENS** **XVPC37 CLAER LENS**		

Software

General

The main programming work lies in programming the Modicon M238 Logic controller and creating the screens for the HMI display.

Programming the Modicon M238 Logic controller is done using SoMachine.

Programming of the Magelis HMISTU655 is done by using Vijeo Designer which is integrated into SoMachine.

Configuration of the drives (ATV12, ATV312 and LXM32C) is done using the control panel on the drive.

To use the software packages, your PC must have the appropriate Microsoft Windows operating system installed:

- Windows XP Professional

The software tools have the following default install paths:

SoMachine

C:\Program Files\Schneider Electric\SoMachine

Vijeo Designer (Installed with SoMachine)

C:\Program Files\Schneider Electric\Vijeo Designer

Communication

General

The Modicon M238 Logic controller and the Magelis HMI STU655 communicate using the SoMachine protocol.

The download from the PC to the M238 and to the HMI is done using a single connection.

The PC has to be connected to the HMI over USB. Using this connection the data is also send across to the M238.

The front panel is used to configure the ATV12, the ATV312 and the LXM32C.

PC ↔ HMISTU655 ↔ M238

The download direction is from the PC to the HMI and via the HMI to the M238.

1. PC
2. HMI STU655
3. Modicon M238 Logic controller
4. USB to USB cable **XBTZG935**
5. RJ45 (HMI) to RJ45 (M238) cable **VW3A8306R30**

Note:
For a direct connection to the M238 the TCSXCNAMUM3P cable should be used

PC ↔ HMI connection cable **XBTZG935** Cable for the connection between a SoMachine-equipped PC and HMISTU655	
Controller ↔ HMI connection cable **VW3A8306R30** **(3m)** Cable for connecting an HMISTU655 and an M238	

Implementation

Introduction

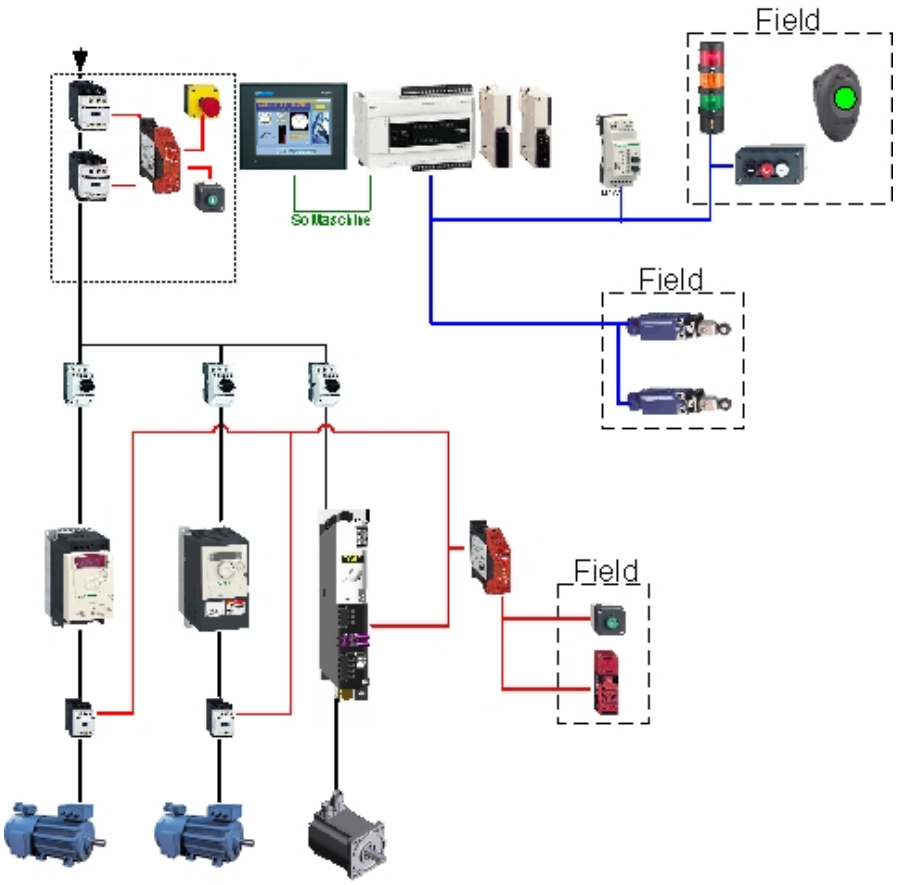
The implementation chapter describes all the steps necessary to initialize, to configure, to program and start-up the system to achieve the application functions as listed below.

Function

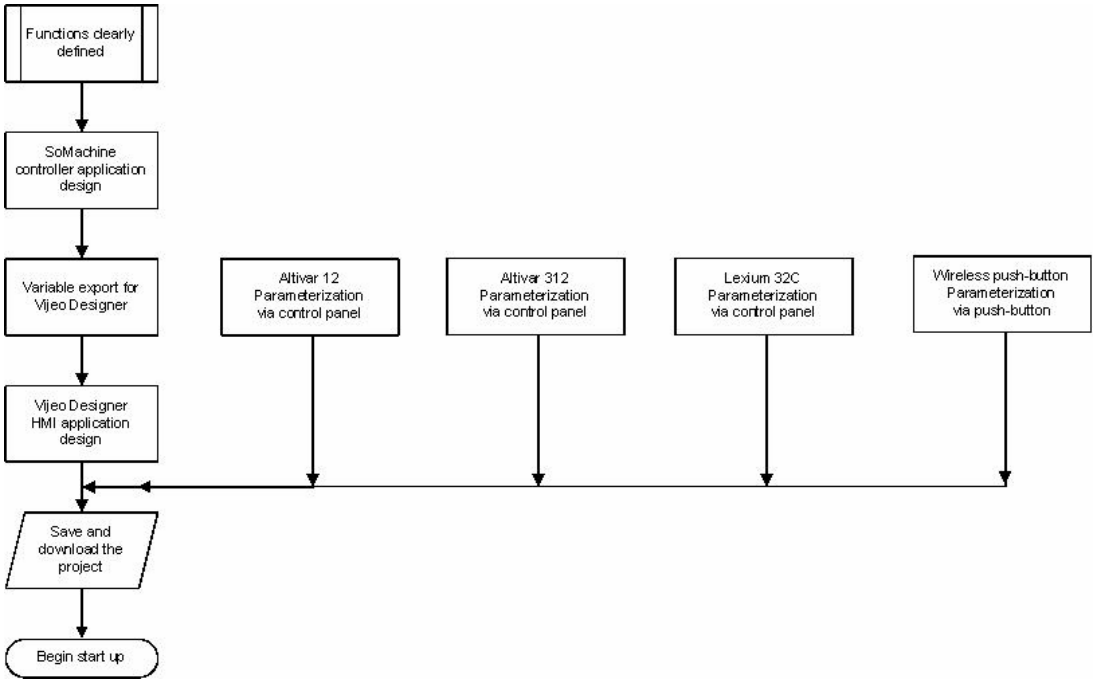
Start up and functional description

1. Verify all motor circuit breakers and Multi9 circuit breakers are in the ON position.
2. Verify that the main switch is in the ON position.
3. Press the "ACKN E-STOP" blue illuminated pushbutton on the main cabinet door to acknowledge the system is energized. The blue illuminated pushbutton will turn OFF if the system is energized.
4. Ensure that all machine interlocks are engaged (i.e. the door guard switches)
5. Press the "ACKN DOOR-READY" blue illuminated pushbutton on the main cabinet door to acknowledge the system is ready for operation. The blue illuminated pushbutton will turn OFF if the system is ready for operation.
6. Use Magelis HMISTU655 to control/monitor the system.
    a. Manual Mode: Using the screens ATV12, ATV312 and LXM32C you can control the drives individually by touching the buttons FWD, REV, STOP and RESET. You can also individually adjust their manual speeds here.
    b. Local Mode: Control the drives from the selector switch located outside the cabinet. Reset drive faults by acknowledging the red illuminated push button. Use the screens ATV12, ATV312 and LXM32C, individually adjust their automatic speeds here.
    c. Use the HMISTU655 screen to configure the HMI.
    d. The “BUS”, “ALARM”, “SAFETY” screens can be used to monitor the network, system status and alarm messages.

Functional Layout



Course of Action


Functions clearly defined
SoMachine controller application design
Variable export for Vijeo Designer
Vijeo Designer HMI application design
Save and download the project
Begin start up
Altivar 12 Parameterization via control panel
Altivar 312 Parameterization via control panel
Lexium 32C Parameterization via control panel
Wireless push-button Parameterization via push-button

Communication

Introduction

This chapter describes the data passed via the communication networks (e.g. CANopen or Ethernet) that is not bound directly with digital or analog hardware.

Device Links

The SoMachine protocol over serial port (RS485) connects:

Magelis HMISTU655 ↔ Modicon M238 Logic controller

The SoMachine protocol is used for the data exchange between the controller and the HMI.

Controller

Introduction

The controller chapter describes the steps required for the initialization and configuration and the source program required to fulfill the functions.

Pre-conditions

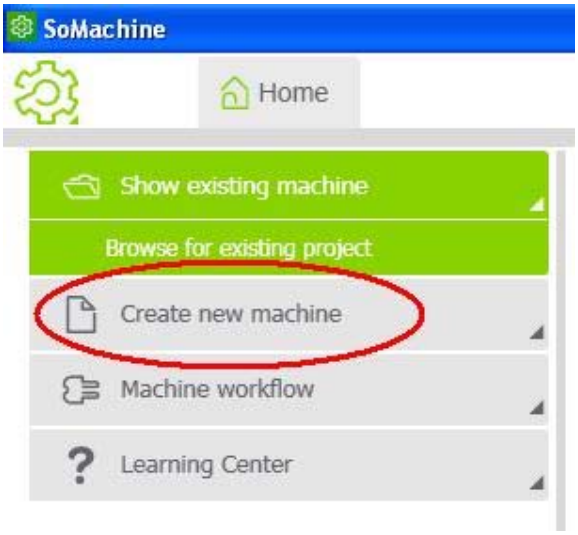
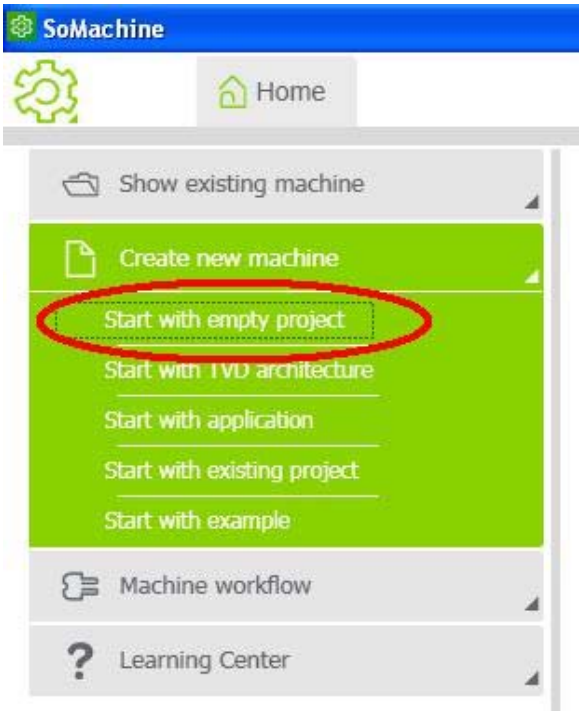
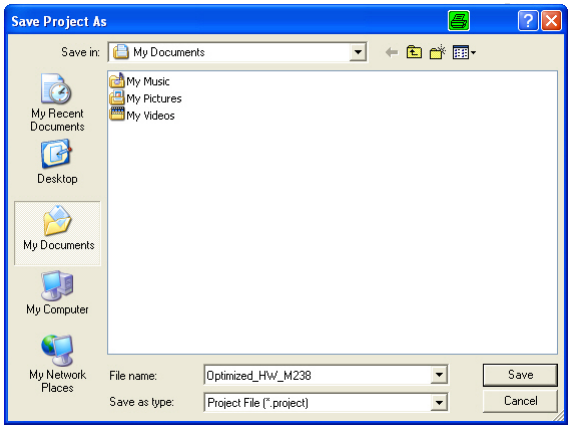
In order to proceed you require the following:

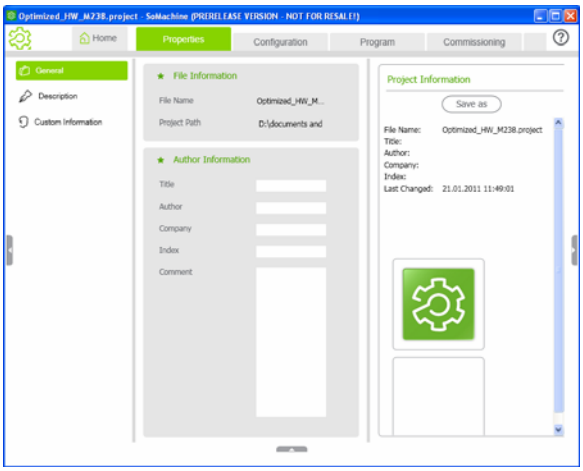
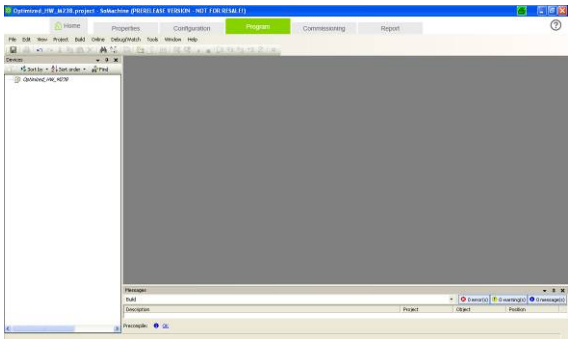
- SoMachine V3.0 is installed on your PC
- The Modicon M238 Logic controller is switched on and running
- The controller is connected to the HMI with the connection cable **VW3A8306R30** (controller to HMI)
- The HMI is connected to the PC via the programming cable **XBTZG935**(HMI to PC)

Setting up the controller is done as follows:

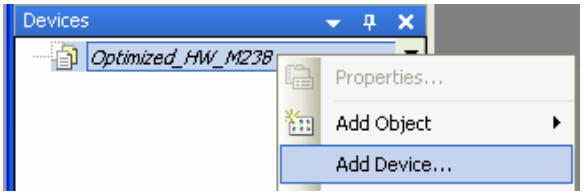
- Create a New project
- Add the Controller
- Add IO Expansion Modules
- Configure PTO Function for LXM32
- Add TeSys Library
- Add POU
- Add Symbol configuration
- Configure Task
- Configure Controller ↔ HMI Data Exchange
- Add Magelis HMI
- Add symbol configurations
- Communication Settings controller ↔ PC
- Communication Settings controller ↔ HMI
- Save the Project
- Build Application
- Download the Controller and HMI program
- Login to the Controller
- Application overview

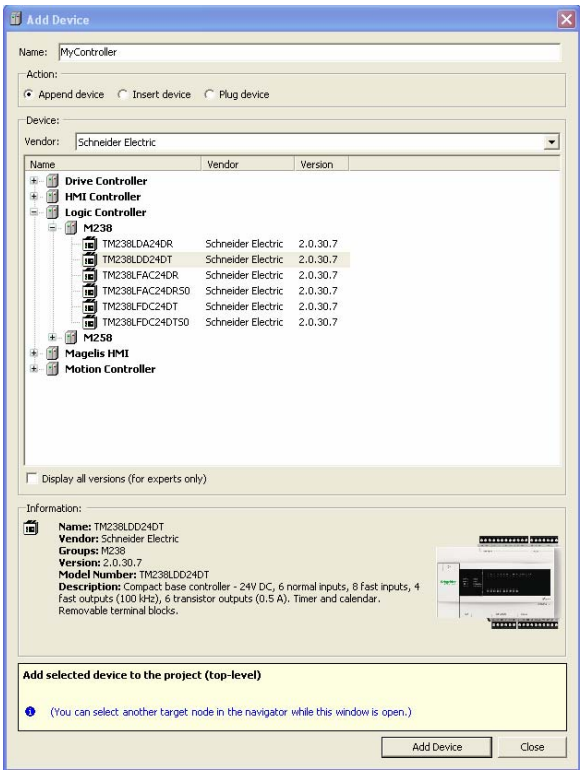
Create a new project

1	To create a new project select **Create new machine.**	
2	Select **Start with empty project.**	
3	In the **Save Project As** dialog enter a **File name** and press **Save.** **Note:** By default the project is saved under My Documents.	

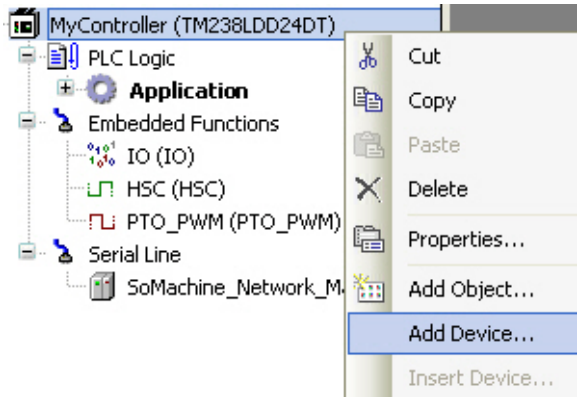
4	The SoMachine User Interface opens and the **Properties** tab is displayed.	
5	In the User Interface select the **Program** tab	
6	The Program windows appears	

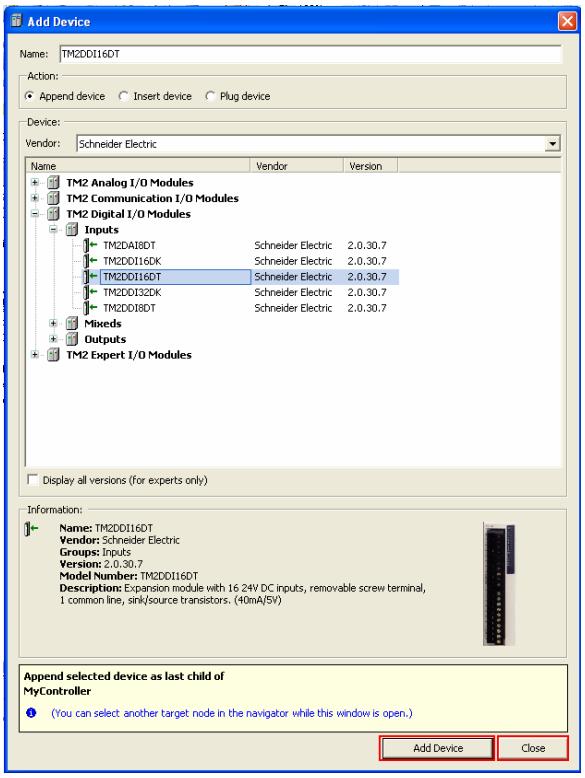
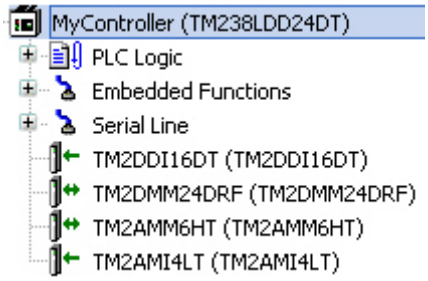
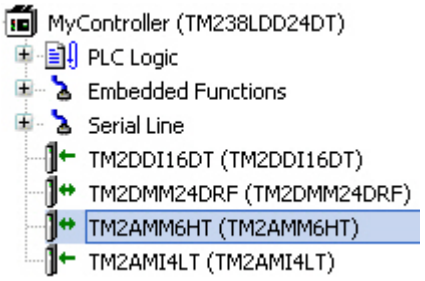
Add the Controller

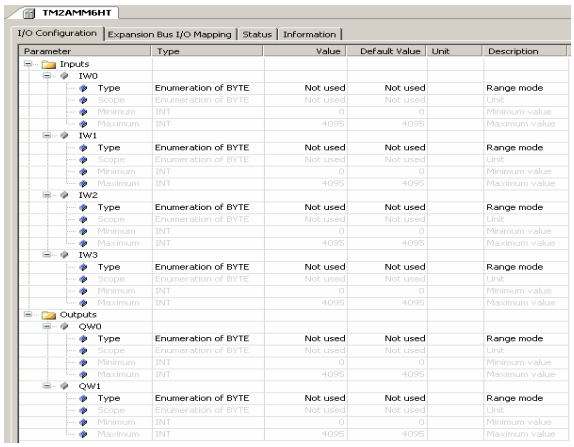
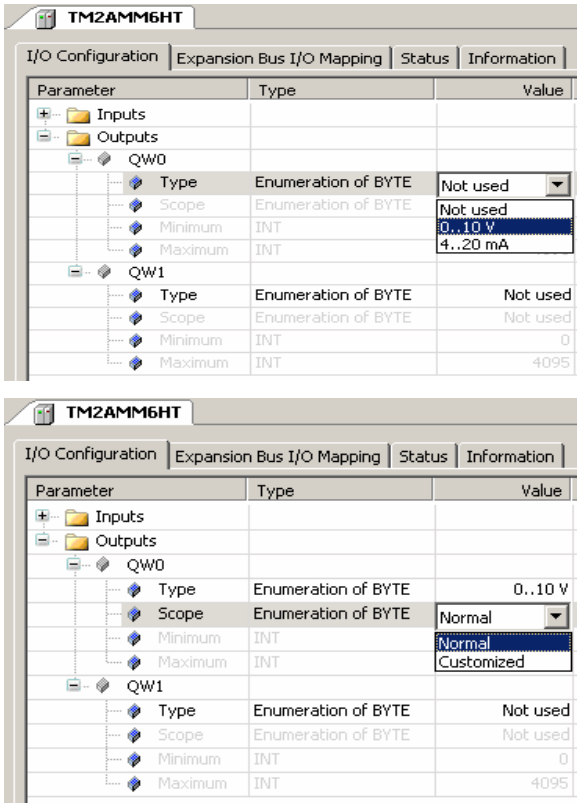
1	Right click on **Optimized_HW_M238.** Select **Add Device…** in the pop up menu.	

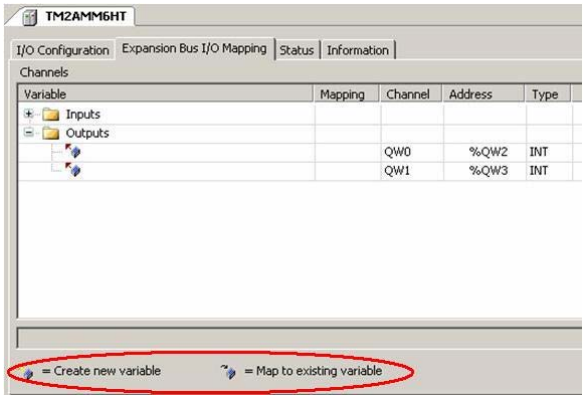
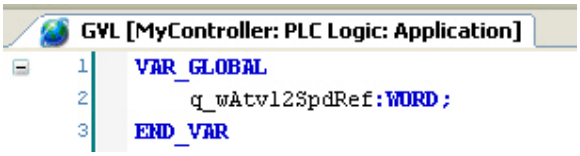
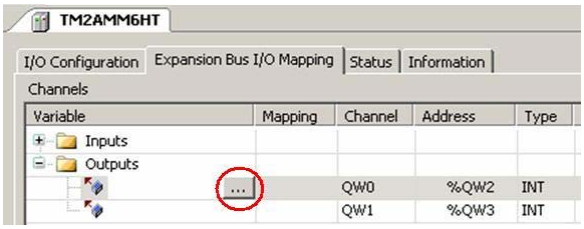
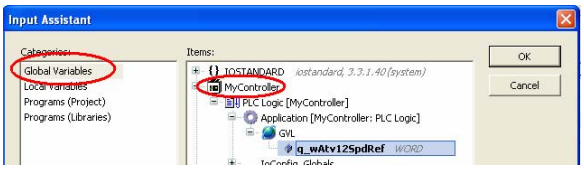
2	Select **Schneider Electric** as **Vendor**. Then select: **Logic Controller →** **M238 →** **TM238LDD24DT** as a controller. Click on **Add Device.** Click on **Close**.	
3	The **Devices** folder display now the new Controller	

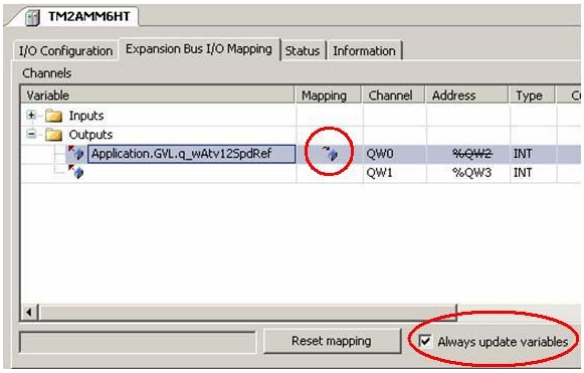
Add IO Expansion Modules

1	To add expansion modules to the controller, right click on **MyController** and click on **Add Device…**.	

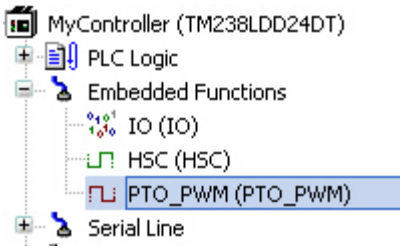
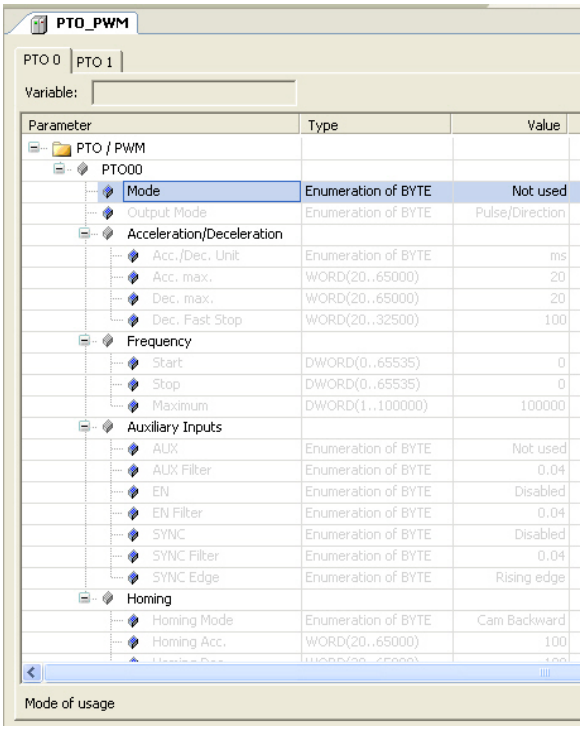
2	In the **Add Device** dialog, select the required I/O expansion modules and click on **Add Device**. For this project, the following modules are used: **1x TM2DDI16DT** **1x TM2DMM24DRF** **1x TM2AMM6HT** **1x TM2AMI4LT** When you have finished adding the modules, click on **Close**.	
3	The added expansion modules can now be seen at the end of the device list. **Note:** The sequence of the modules have to be consistent with the sequence of the actual hardware, i.e. in this application, the TM2DDI16DT module is attached next to the controller whereas the TM2AMI4LT is attached furthest away from the controller.	
4	To configure an expansion module, double click on it. Here we will configure the analog output of the expansion module **TM2AMM6HT**.	

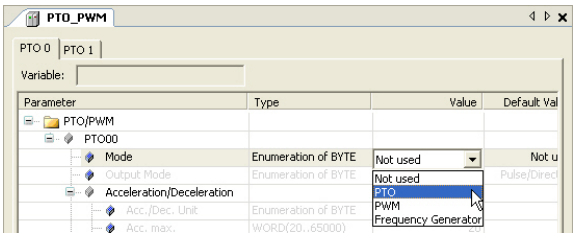
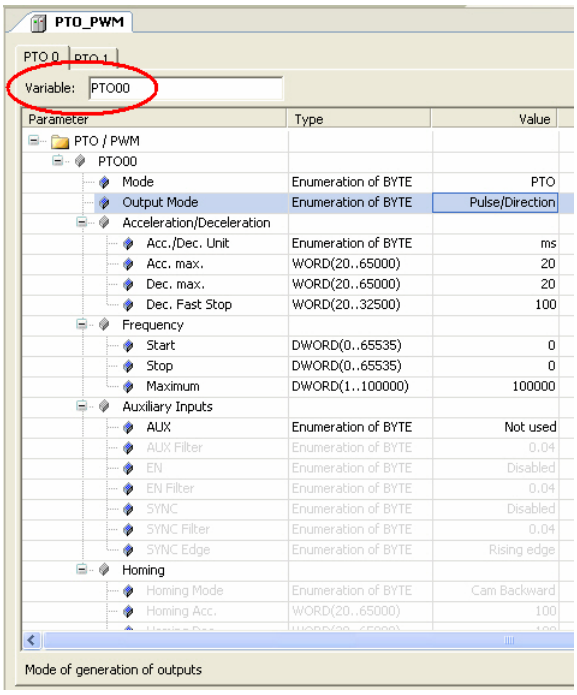
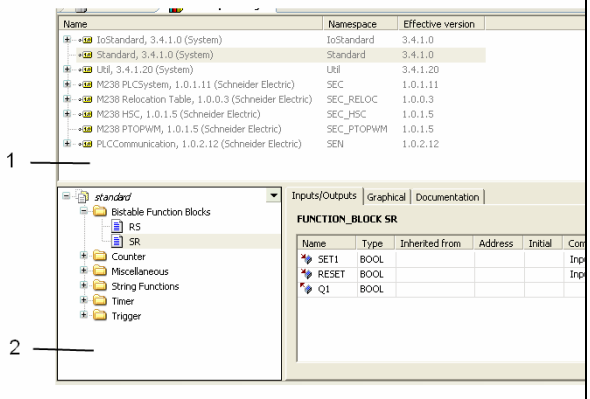
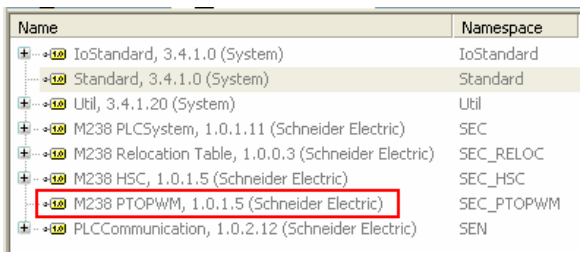
5	In the **I/O Configuration** tab…	
6	…the **Value** of the **Enumeration of BYTE** for the **Type** of **QW0** is changed to **0..10 V**. Press enter to accept the new selection. The **Value** of the **Enumeration of BYTE** for the **Scope** of **QW0** can be selected between **Normal** (fixed min and max values) and **Customized**.	

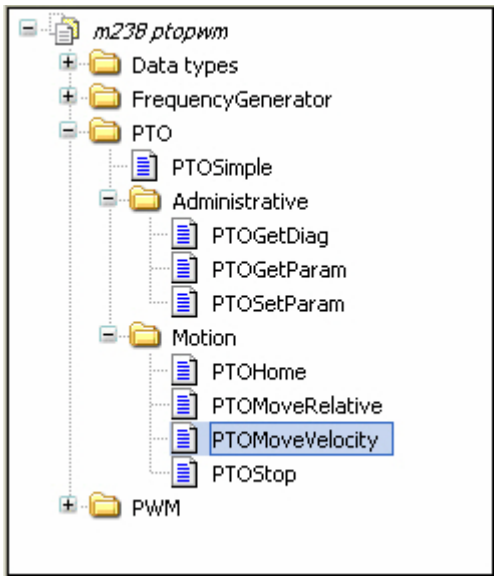
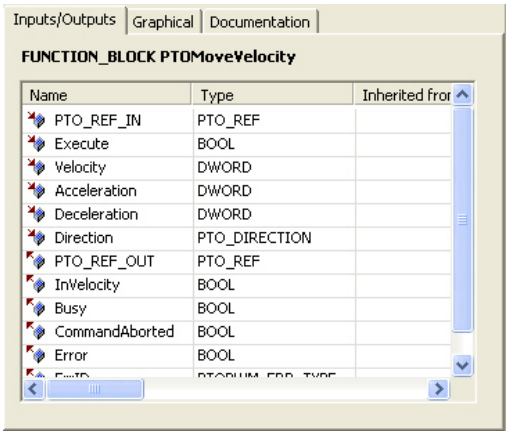
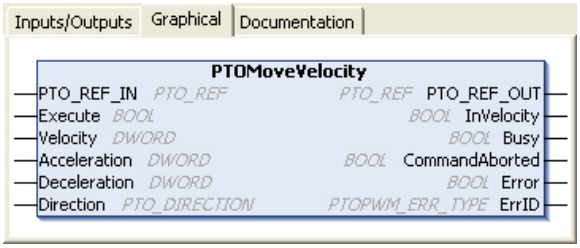
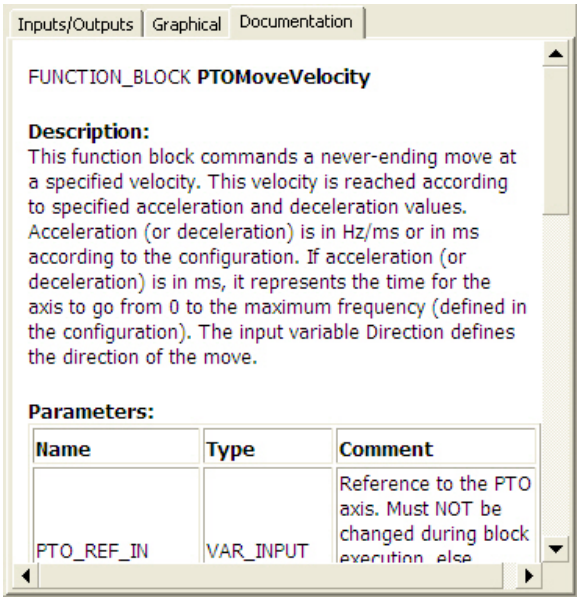
7	On the **Extension Bus I/O Mapping** tab it is possible to map the data of **QW0** to a variable. There are two ways of **Mapping**: Create a new variable Mapping to an existing variable In this project, **Map to existing variable** was used, i.e. the output is mapped to an existing variable that is located in the folder **Application → GVL**. GVL stands for global variables list, which can be accessed throughout **Application**. The GVL is opened by double clicking on **GVL** in the **Devices** window. In this application, **q_wAtv12SpdRef** is declared as a WORD variable in the **Application**'s **GVL (Application.GVL.q_wAtv12 SpdRef)**.	 
8	To map the output to an existing variable, double click on the output **Variable** field then click on the **…** button that appears at the end of the field. In the **Input Assistant** dialog that opens, locate the variable inside the **Global Variables** category and select it. Then click **OK**.	 

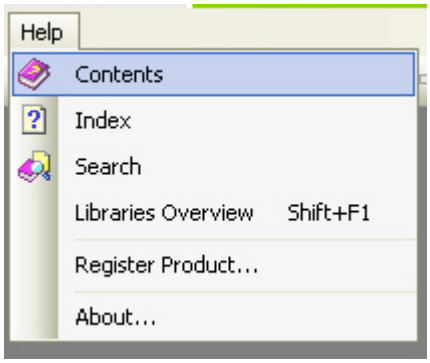
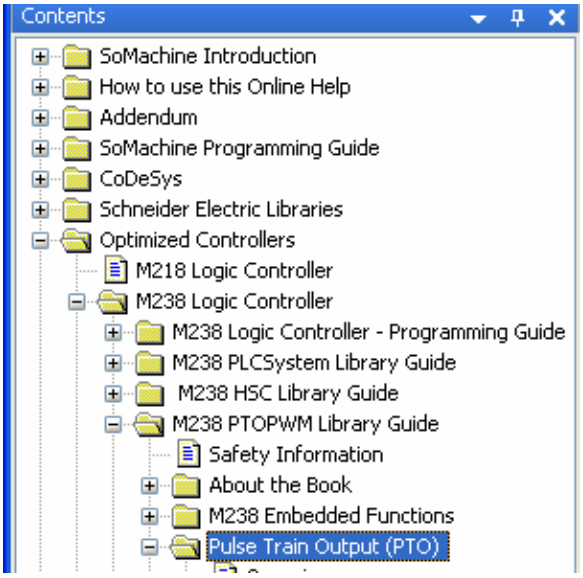
9	The analog module's output WORD, QW0, will now map itself to **Application.GVL.q_wAtv12 SpdRef**. To update the status of all the I/O variables in every cycle with the newest I/O data, check the **Always update variables** box. If left unchecked, only the status of the I/O variables that are called in the POUs are updated. **Note:** The statuses of the mapped I/O variables that are used in the HMI but are not called by any POU are not updated if the **Always update variables** box is unchecked.	

Configure PTO Function for LXM32C

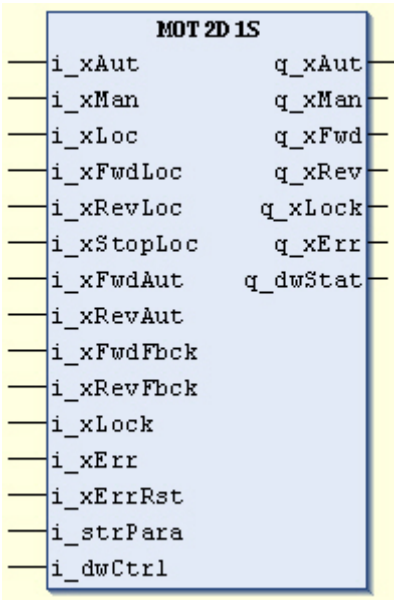
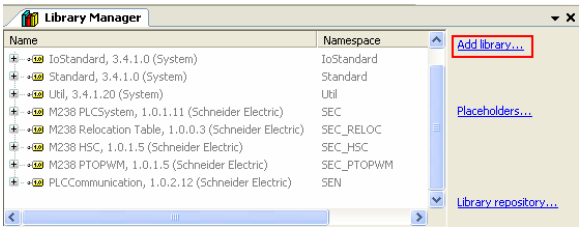
1	To configure the PTO function, double click on **Embedded Functions → PTO_PWM** in the **Device** list.	
2	In the **PTO 0** tab…	

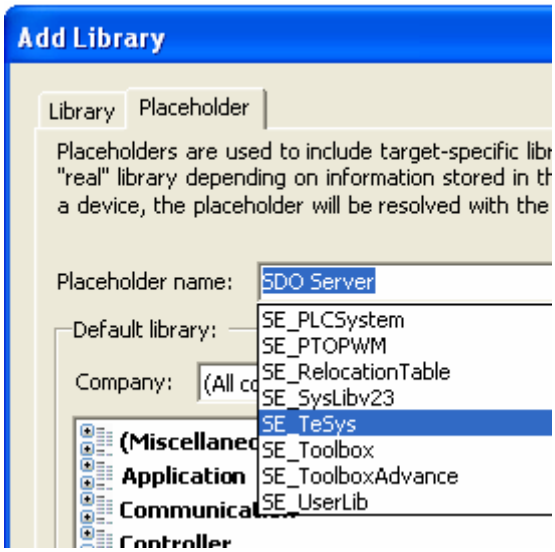
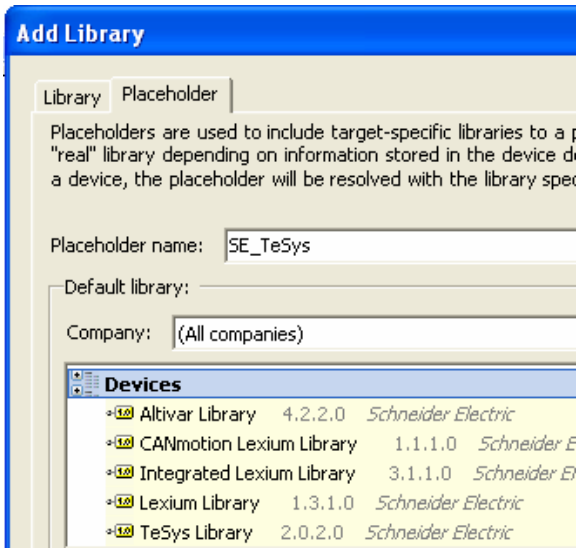
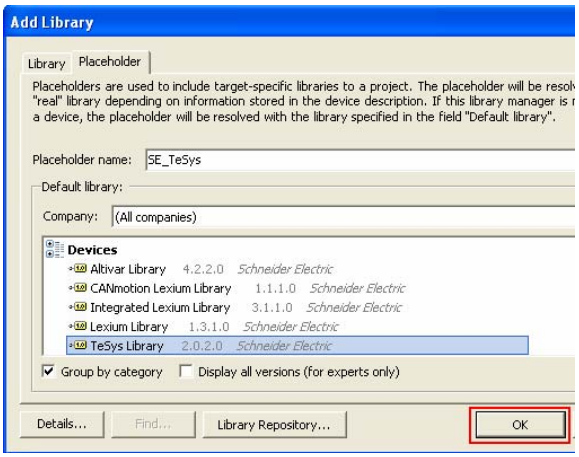
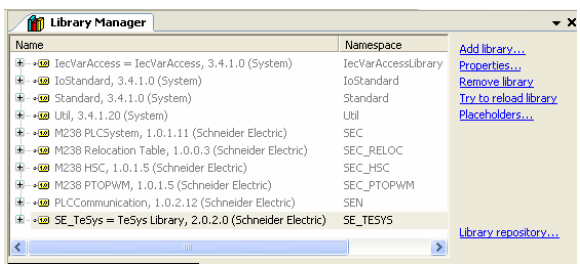
3	…the **Value** of the **Enumeration of BYTE** for the **Mode** of **PTO00** is changed to **PTO**.	
4	By default, the **PTO 0** output of the M238 controller is mapped to a **Variable** called **PTO00**. In this application, the **PTO 0** default settings are used.	
5	The library that manages the PTO of the M238 controller is located inside the **Library Manager**. Double click on **Library Manager** in the **Device** window to open the **Library Manager** editor.	
6	The **Library Manager** editor has the following components: 1. Libraries currently included in the project 2. Modules (for example: FBs) of the currently selected library showed in the lower part of the Library Manager 3. Information of the module currently selected in the lower part of the Library Managed	
7	The library **M238 PTOPWM** is directly loaded into the project when a M238 controller is used in the application.	

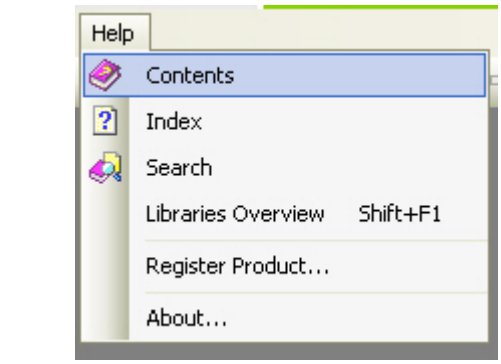
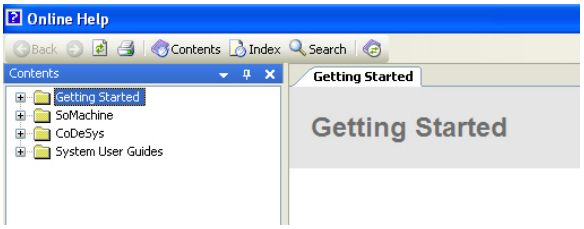
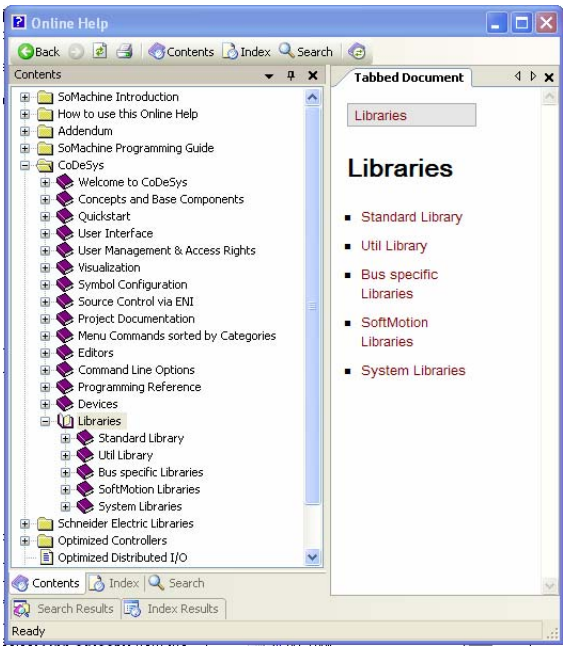
8	When you select the **M238 PTOPWM** library from the list, the PTO modules are displayed in the lower left part of the editor. In the lower right part of the editor, the following tabs are displayed:	
	Inputs/Outputs tab	
	Graphical tab	
	Documentation tab	

9	More information on the M238 controller libraries and the PTO function can be found inside the **Online Help.** To open the **Online Help** window left click on **Help →** **Contents**	 

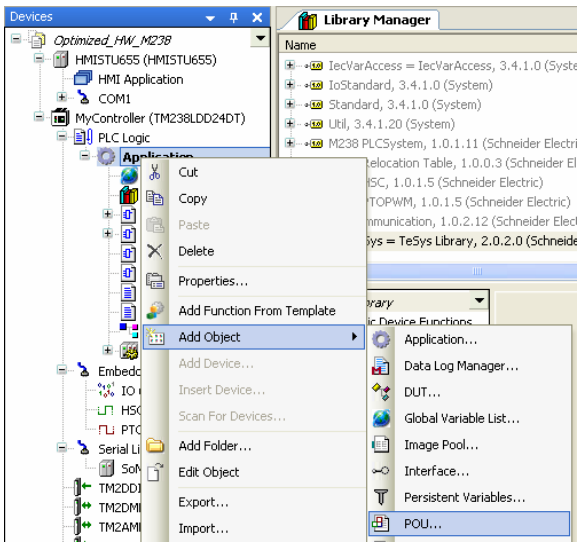
Add TeSys Library

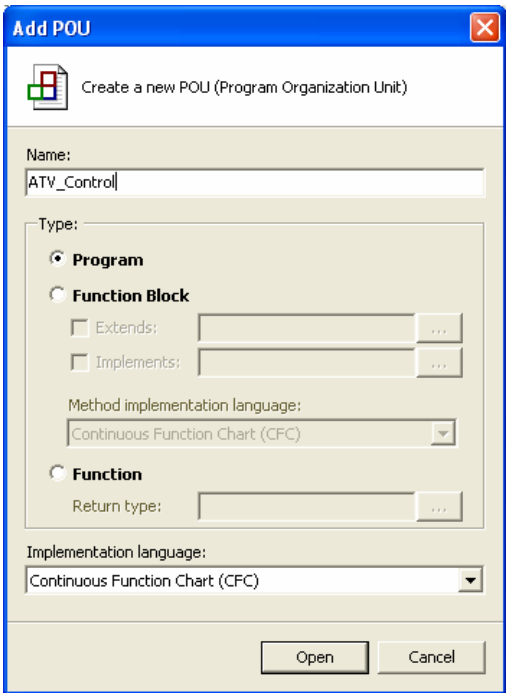
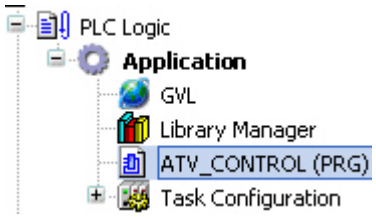
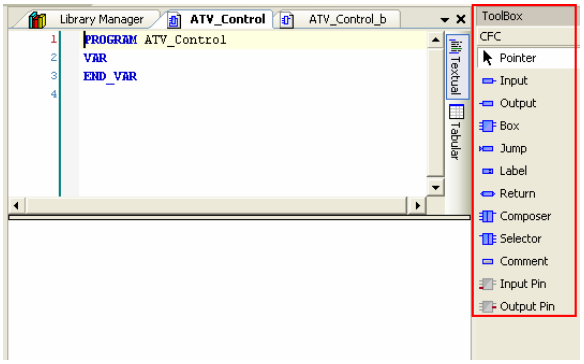
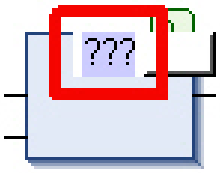
1	In this application, the function blocks **MOT2D1S** were used to manage the forward and reverse control of the ATV12, ATV312 and LXM32 drives. These function blocks are included inside the TeSys library.	
2	To add the TeSys library, click on **Add library…** in the **Library Manager** editor.	

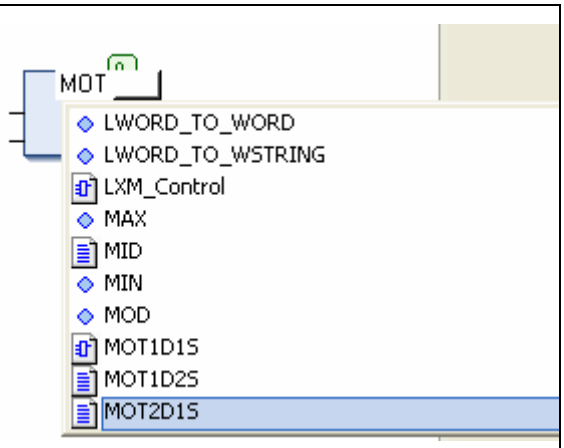
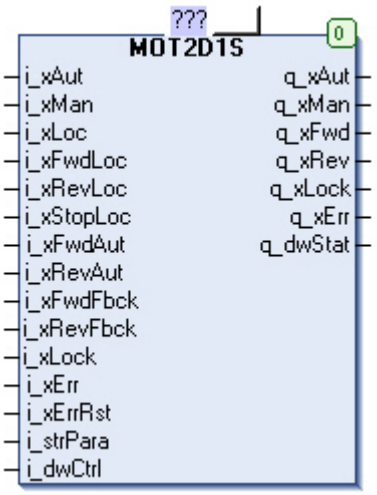
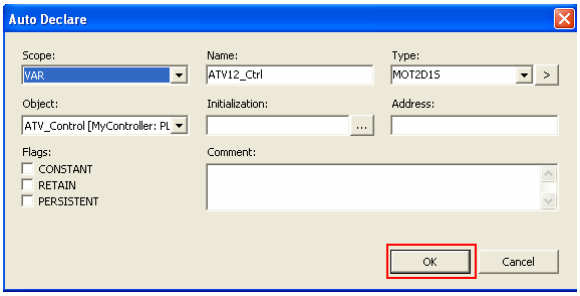
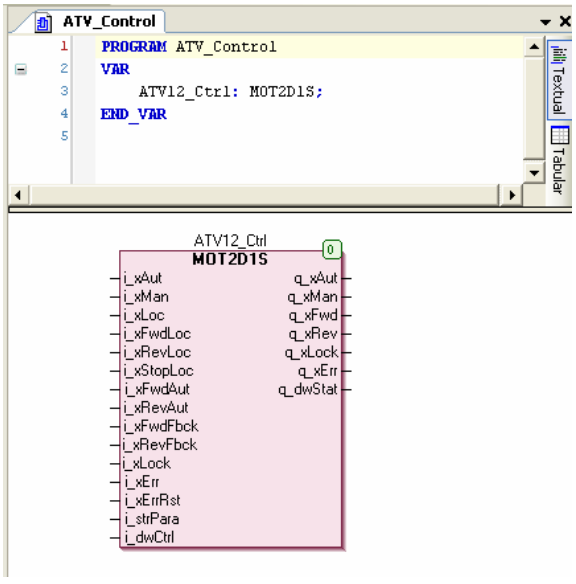
3	In the **Add library** dialog, **Placeholder** tab, select: **Placeholder name: SE_TeSys** select: **Devices →** select: **→ TeSys Library** And click on **OK** to insert the **TeSys Library** into the Library Manager.	  
4	The new library can now be seen in the **Library Manager** editor list.	

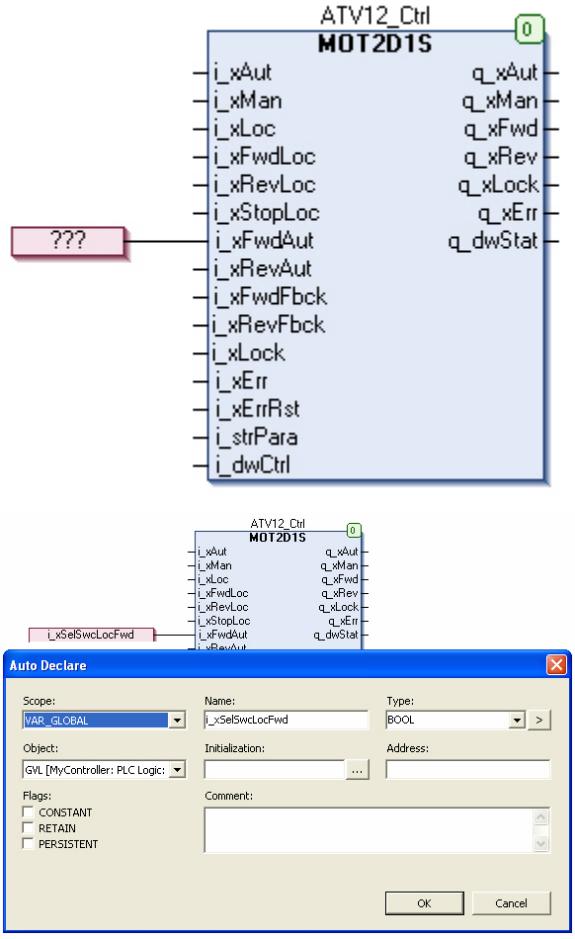
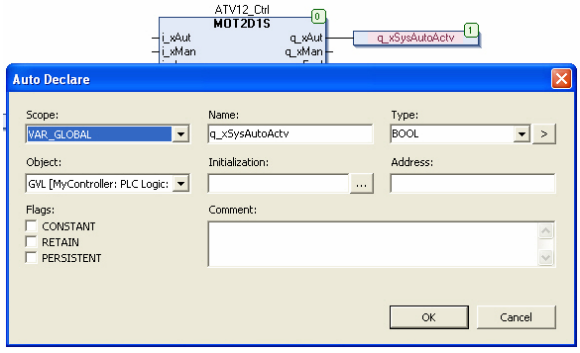
5	More information on the TeSys library, its modules and other Schneider Electric libraries can be found in the **SoMachine Online Help** under the **Help** menu by click on **Contents**.	 
6	Information on System libraries and their modules can be found in the Online Help under the folder **CoDeSys** -> **Libraries**	
7	Steps 2 to 4 have to be executed when adding a new library.	

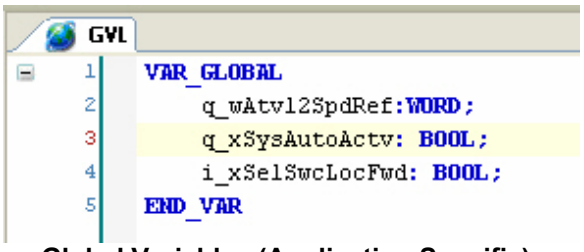
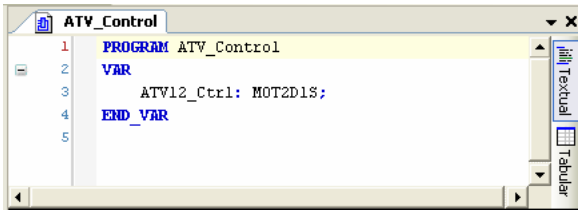
Add POU

1	To add a POU to the project, right click on **Application** and select → **Add Object** →**POU…** from the pop-up menu.	

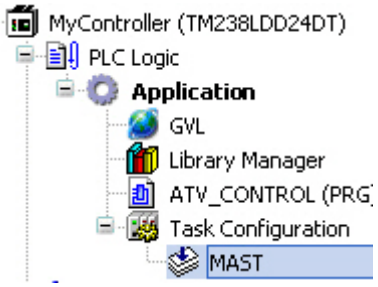
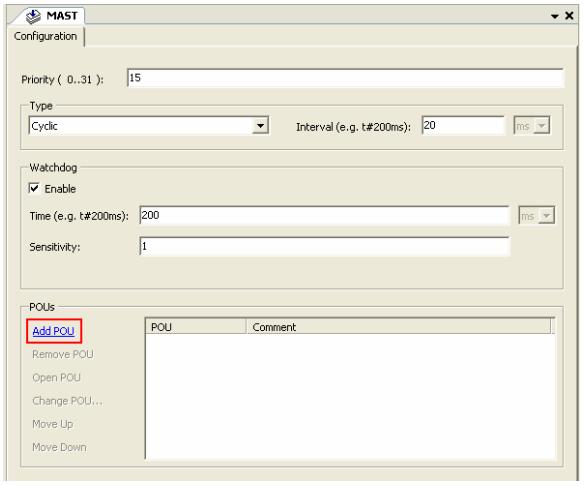
2	In the **Add POU** dialog that opens, enter a **Name** (here **ATV_Control**). Select **Program** as the **Type** and **CFC** as the **Implementation language**. It is possible to select all the IEC languages and to generate functions and function blocks. Click on **Open** to confirm and to close the dialog.	
3	The new **POU ATV_CONTROL** is now visible under **Application**. If the **ATV_CONTROL tab** is not opened, double click on **ATV_CONTROL** to open it.	
4	The upper frame displays the declaration section. The lower frame is for programming. On the right side is the **ToolBox** window**.** Use drag and drop with the toolbox to place example templates in the programming section.	
5	Begin by placing a box element in the programming section. Then click on **???**.	

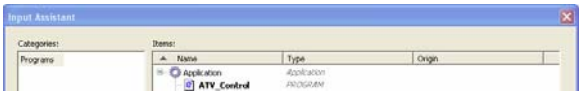
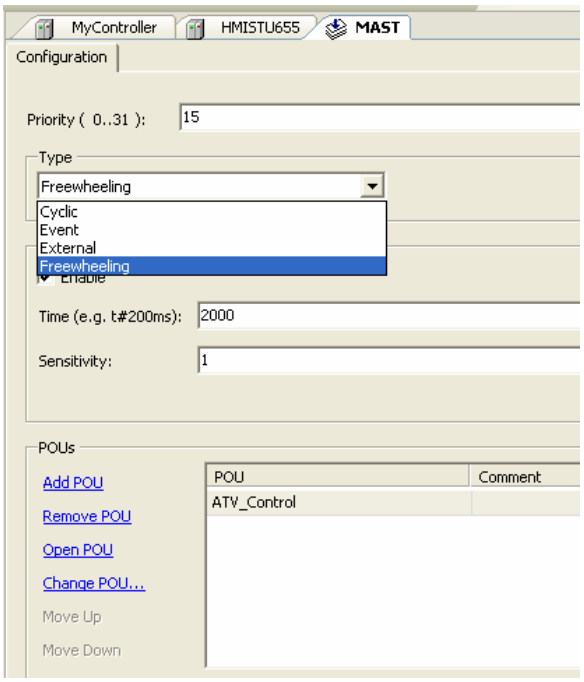
6	Type in a name for the function or function block. As the first letters are typed, a pop-up menu opens with a list of modules that begins with those letters. In this project, the MOT2D1S FB was used for controlling the forward and reverse commands of the drives. Select **MOT2D1S** from the list and press enter twice.	
7	To instantiate the FB, click on **???** and…	
8	… type in a name (for example ATV12_Ctrl) and press enter. The **Auto Declare** dialog opens. Click **OK** to create the instance. **Note:** The variable comment can be added in the **Comment** box**.**	
9	The new **FB MOT2D1S** is instantiated in the declaration section of the **ATV_CONTROL**.	

10	To connect a variable to an input, place an input element from the **ToolBox** on the input side of the FB and connect the input box to an FB input by clicking on the **red end** and dragging it to the input of the FB. Click on **???** in the input box and insert the variable name: **i_xSelSwcLocFwd** In the **Auto Declare** dialog that opens, select the **Scope** and **Type** and confirm the variable **Name**. In this example, select **VAR_GLOBAL** and **BOOL** from the **Scope** and **Type** list box respectively.	
11	Connecting a variable to an output is done similarly as the input, but here, a new variable is created. Click on the **???** in the output field, type in a name for the variable and then press enter. In the **Auto Declare** dialog that opens, select the **Scope** and **Type** and confirm the variable **Name**. In this example, select **VAR_GLOBAL** and **BOOL** from the **Scope** and **Type** list box respectively. When finished, click on **OK**.	

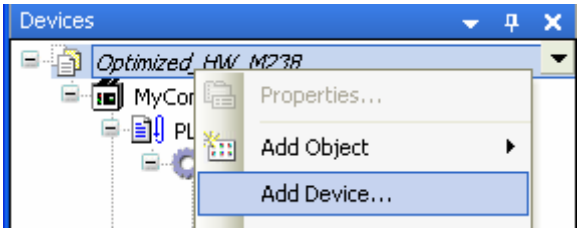
12	The **VAR_GLOBAL** variables are located in the **GVL** folder. All variables located in this folder can be accessed throughout **Application**. If the variables are declared inside the POU, they can only be accessed by the POU (local variables).	 **Global Variables (Application Specific)**  **Local Variables (POU Specific)**

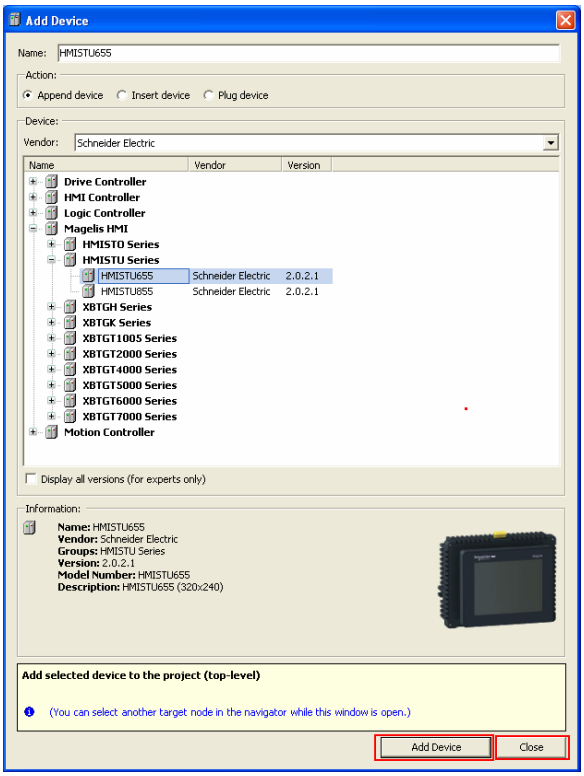
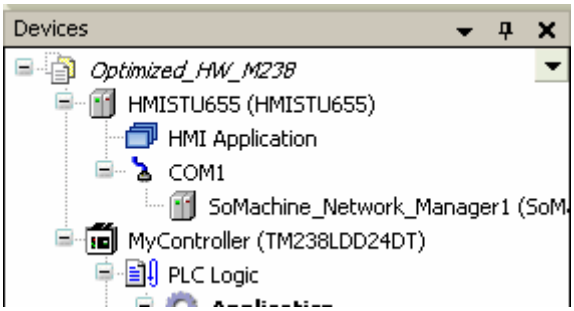
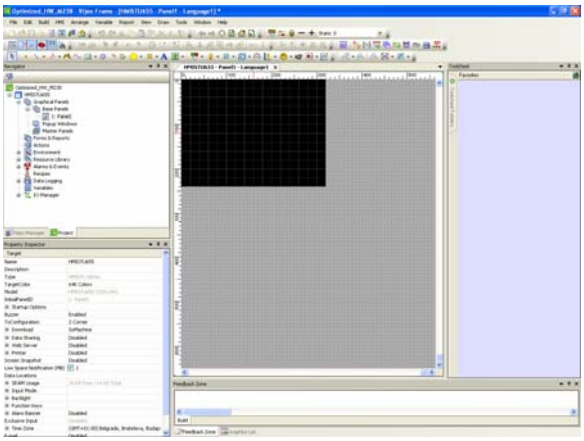
Configure Task

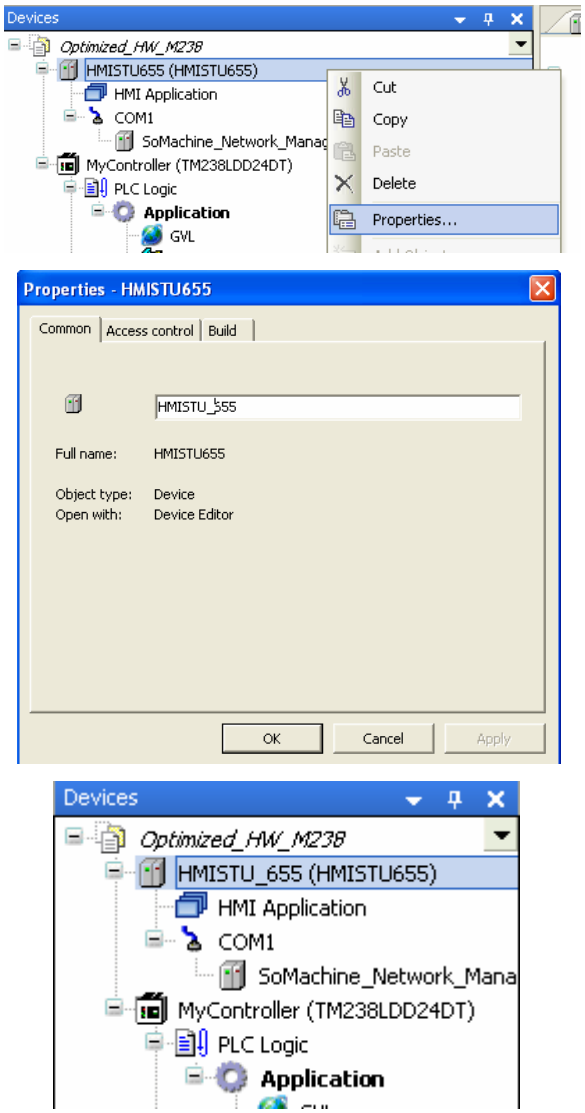
1	The **Task Configuration** in the **Devices** window defines one or several tasks for controlling the processing of an application program. To start working with the new POU, it has to be added to a Task. Here, the POUs are added to **MAST** task. To do this, double click on **MAST** task. **Note:** If a POU is not included in a TASK, it will not be cyclically invoked.	
2	In the **MAST** tab, click on **Add POU**.	

3	In the **Input Assistant** dialog, select **Programs** from the **Categories** list and select the new POU from the **Items** list. In this application, the new POU is **ATV_CONTROL**. Click on **OK** to confirm. **Note:** You have to add all POUs in the program!	
4	The POU is now included in the **MAST** task. In the upper left of the **MAST** task configuration, the **Type** of task can be modified. In this project, **Freewheeling** was selected. Close the tab when finished.	

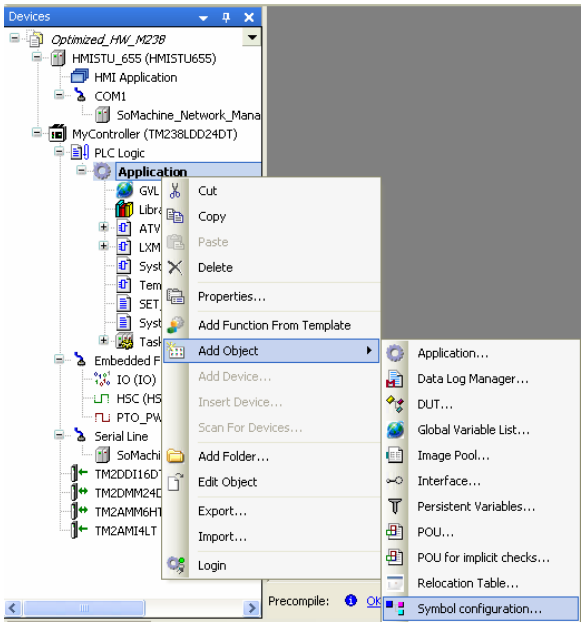
Add Magelis HMI

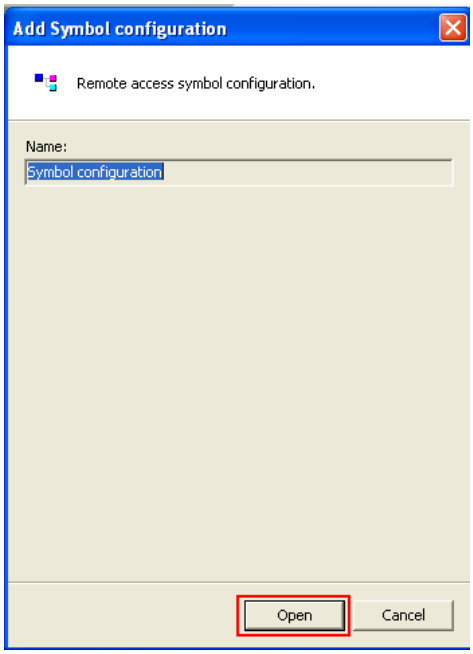
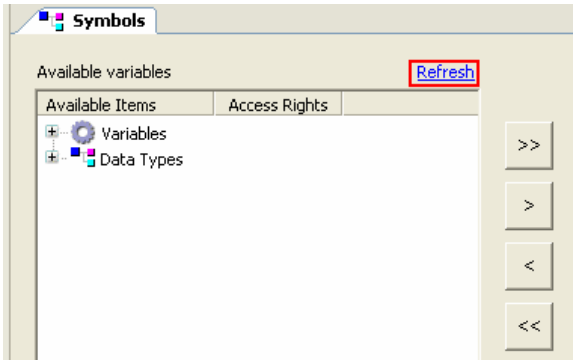
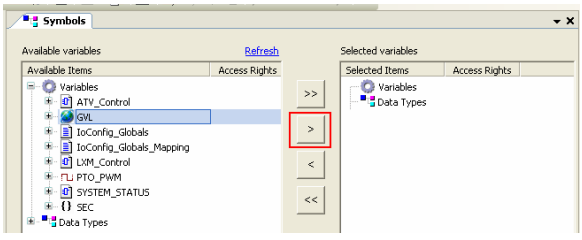
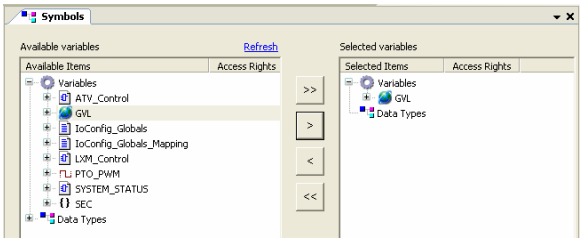
1	To add a Magelis HMI unit to the project, right click on the project name and select **Add Device…** from the pop-up menu. In this project, it is **Optimized_HW_M238** **→ Add Device...**	

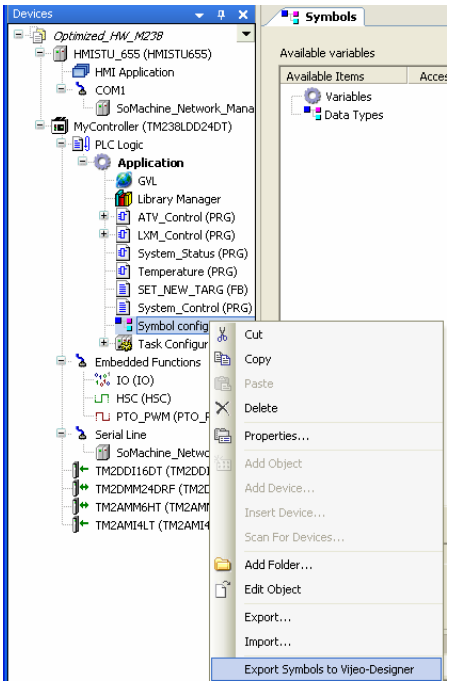
2	In the **Add Device** dialog, select **Schneider Electric** as **Vendor.** Click on: **Magelis HMI →** **HMISTU Series →** **HMISTU655** Click on **Add Device** and click on **Close**.	
3	The new **HMISTU655** is now listed under the project in the **Device** window. **Note:** When a Magelis HMI is added to a project, the programming software Vijeo Designer opens in a new window and you can start programming. (See HMI Chapter)	 

4	To change the name of the device, right click on the device **(HMISTU655)** in the project browser and select **Properties…** in the pop-up menu. Then enter the new name and click **OK**.	

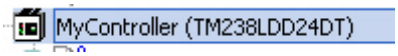
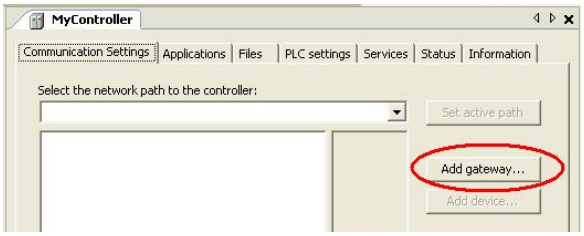
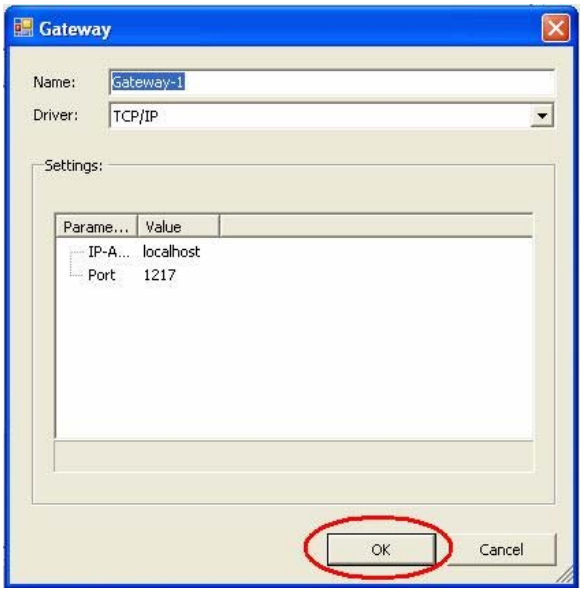
Configure Controller ↔ HMI Data Exchange

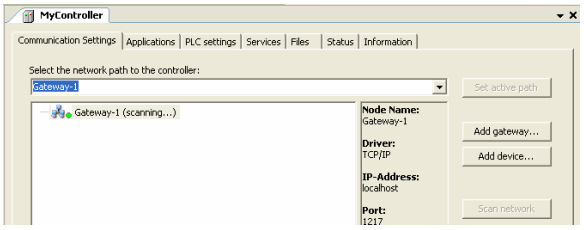
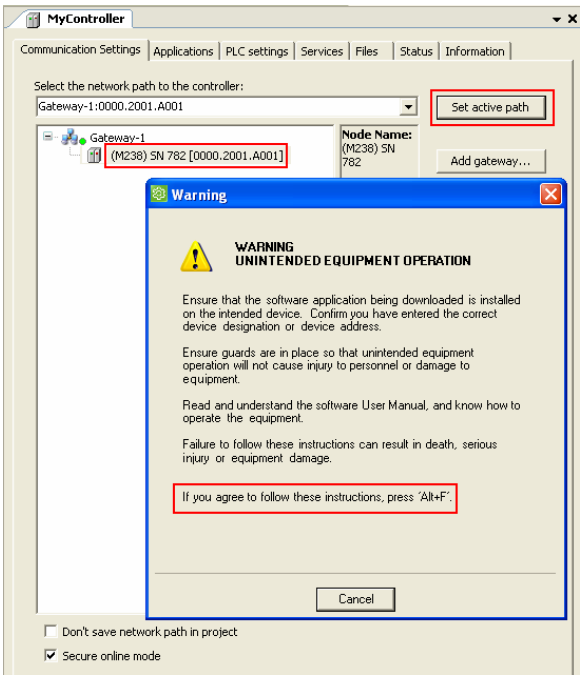
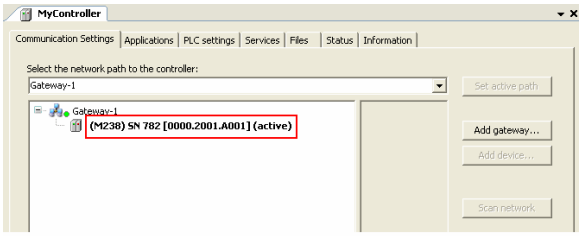
1	To link the variables between the controller and the HMI, the object Symbol configuration is used. To add a Symbol Configuration, right click on **Application** and select **Add Object… →** **Symbol configuration**	

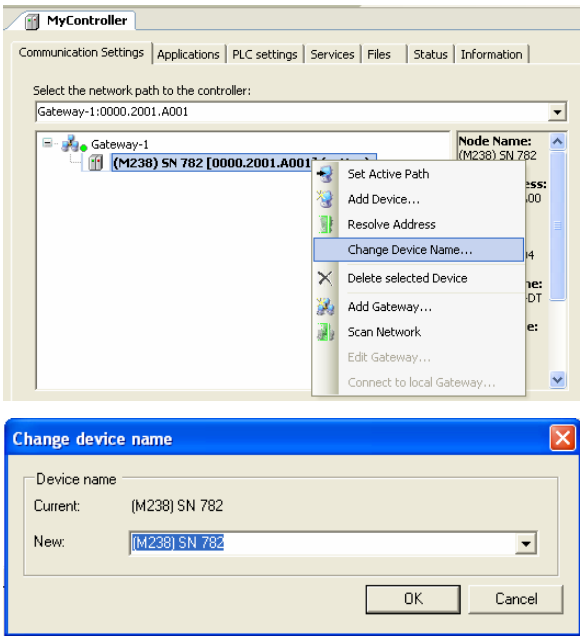
2	A pop-up **Add Symbol configuration** opens. Click on **Open**.	
3	In the opened **Symbol configuration** tab, click on **Refresh**.	
4	Check the **Messages** window for the compilation result and correct any compilation errors. **Note:** The **Symbol configuration** cannot be refreshed when there are errors in the program.	
5	All Variables created in the user program are shown in the **Variables** list. In this project, as all variables are global variables, they are located in the **GVL** folder. To link the variables from the controller to the HMI, select **GVL** and click on **>**.	
6	The right frame now lists the **Selected variables** which are to be used the HMI.	

7	To export the selected variables to Vijeo Designer: Right click on **Symbol configuration** and select **Export Symbols to Vijeo-Designer.**	

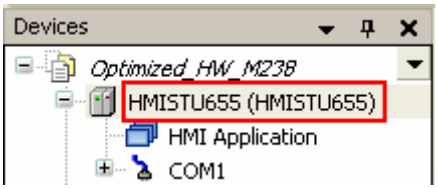
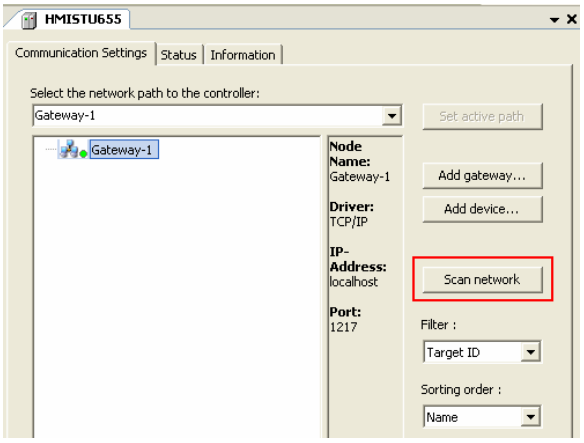
Communication Settings Controller ↔ PC

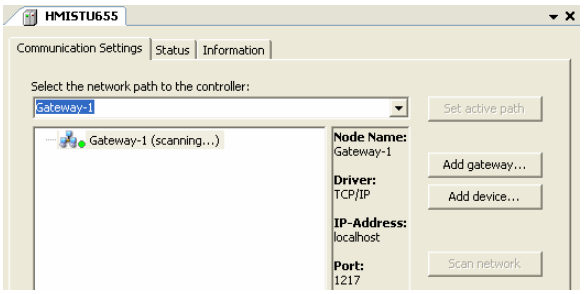
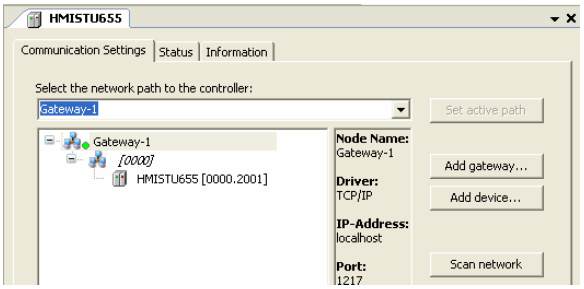
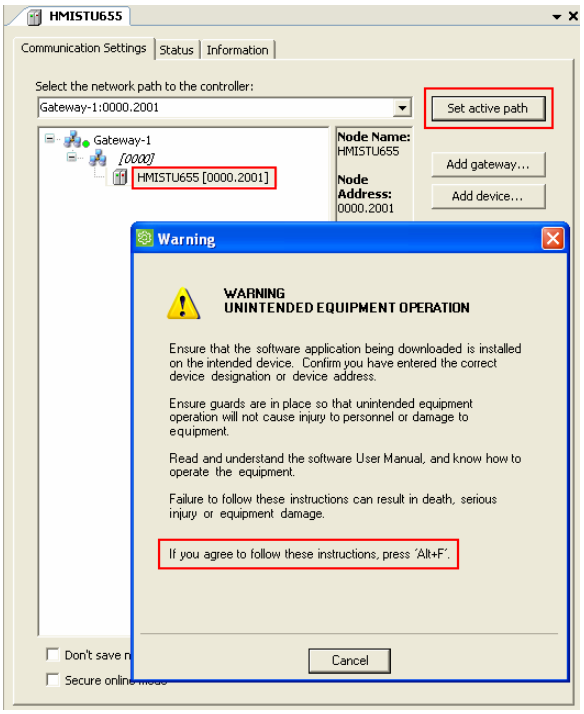
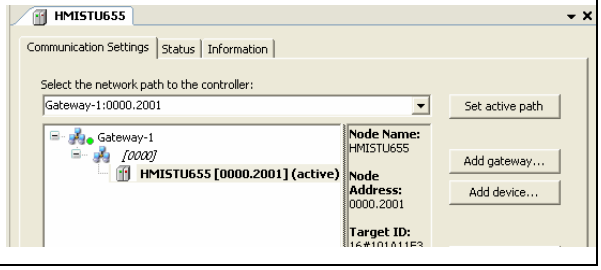
1	To configure the communication gateway, double click on **MyController**.	
2	On the **Communication Settings** tab click on: **Add gateway...**	
3	Keep the default settings and click on **OK.**	

4	Select **Gateway-1** and click on **Scan network**. **Note:** Confirm that the controller is connected to the PC via the HMI.	
5	During the scan, the **Scan network** button becomes grayed out. When the scan is finished, the **Scan network** button becomes active again and the devices that have been detected are listed under **Gateway-1**. Select the controller that is being used and click on **Set active path**. A hazard message pop-up window appears. Read the message and confirm.	 
6	The controller is now bolded and marked (**active)**.	

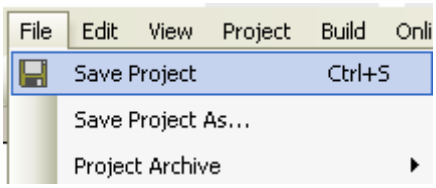
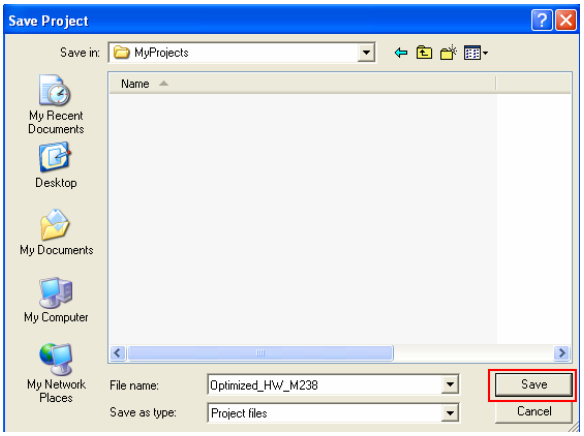
7	**Note:** Every M238 has a unique Serial Number that is a part of the default name (in this case: **SN 782**). If you would like to change the default name of your controller right click on **(M238) SN 782** and select **Change Device Name** In the displayed pop-up window enter the new unique name for your controller. In our example we keep the factory setting name.	

Communication Settings HMI ↔ PC

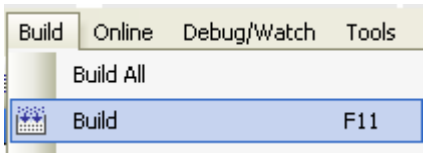
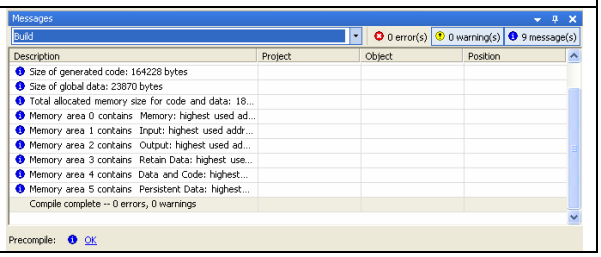
1	To configure the communication gateway double click on **HMISTU655**.	
2	Select **Gateway-1** and click **Scan network**. **Note:** Confirm that the HMI is connected to the PC.	

3	During the scan, the **Scan network** button becomes grayed out. When the scan is finished, the **Scan network** button becomes active again and the devices that have been detected are listed under **Gateway-1**. Select the HMI that is being used and click on **Set active path**. A hazards message pop-up window appears. Read the message and confirm.	  
4	The HMI is now bolded and marked **(active)**.	

Save the Project

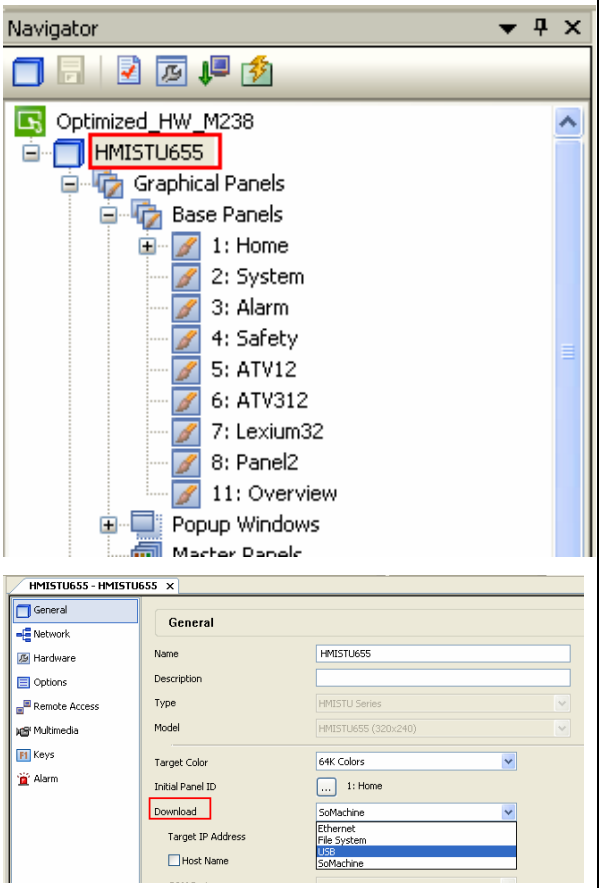
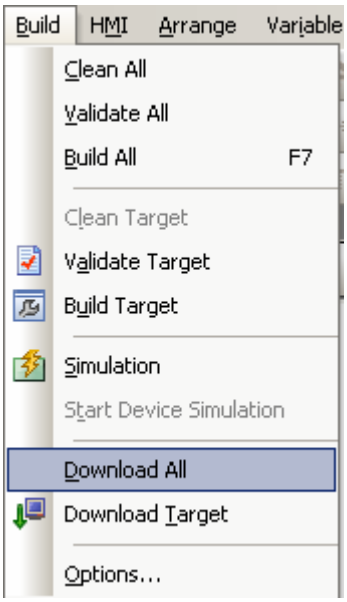
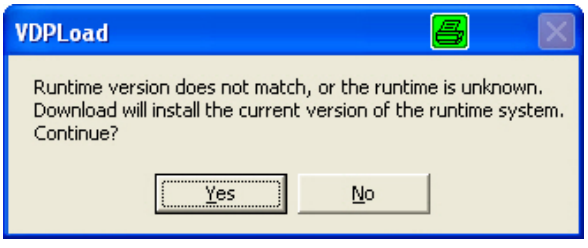
1	To save the project, click **File → Save Project** To save the project under a different name, click **File → Save Project As…**	
2	In the **Save Project** dialog that opens after clicking on **Save Project As…**, enter the new **File name** and click on **Save**.	

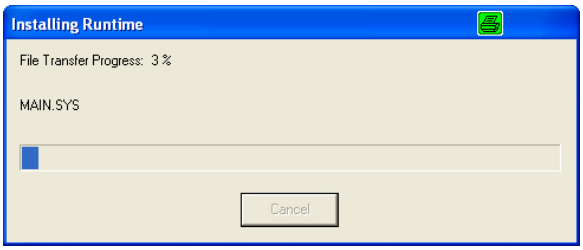
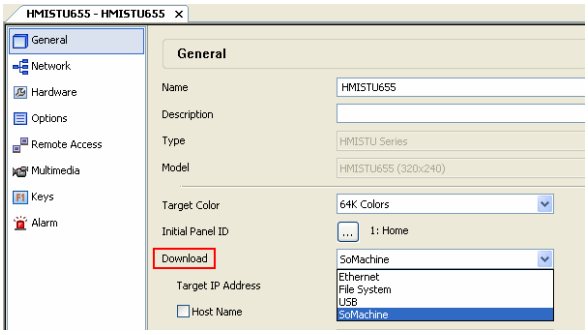
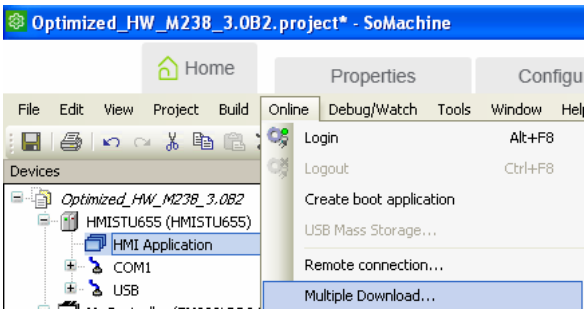
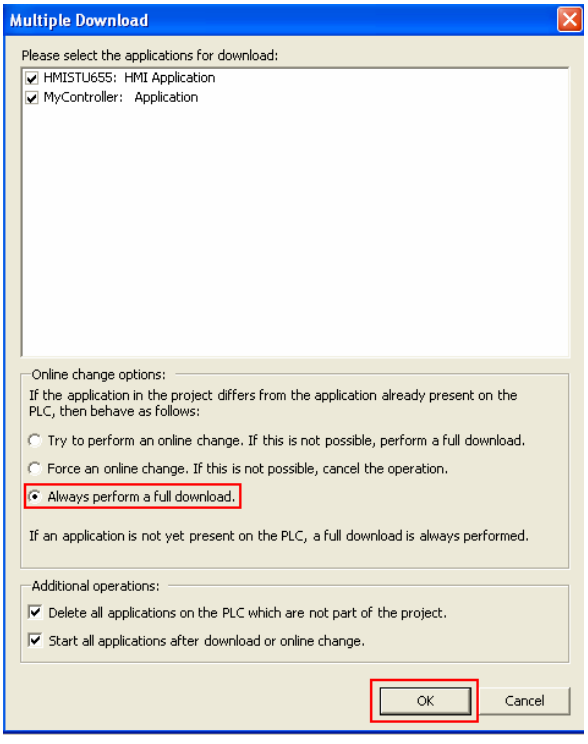
Build Application

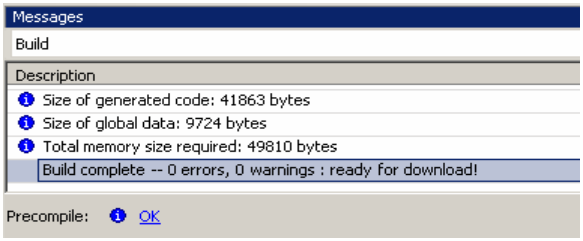
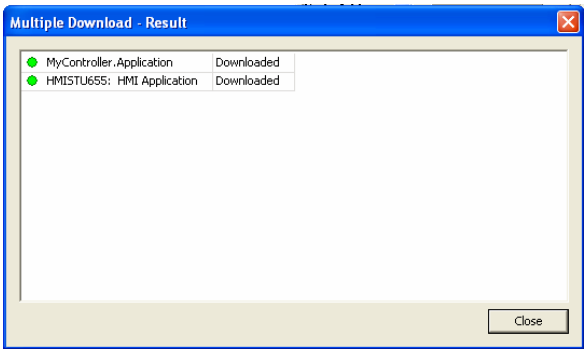
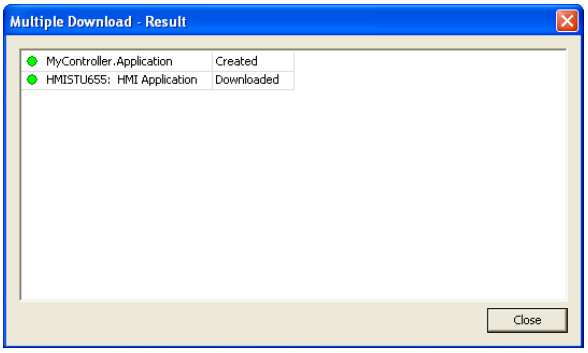
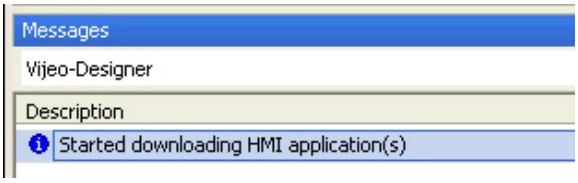
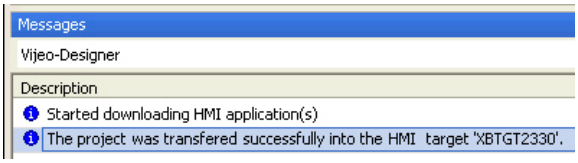
1	To build the application, click on **Build →** **Build** **Note:** To build the whole project (both HMI and Controller) click **Build all**.	
2	After the build, the **Messages** window will describe whether the build was successful or not. If the build was not successful there will be a compilation error list in the **Messages** window.	

Download the controller and HMI projects

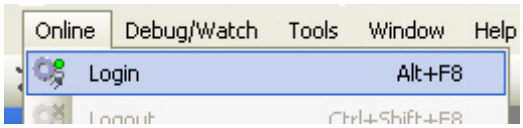
1	**Note:** If it is the first time you are connecting to the HMI, you first have to download the latest runtime version to the HMI using Vijeo Designer. This first download is described in the following steps. If this is not the first download go directly to step 7.

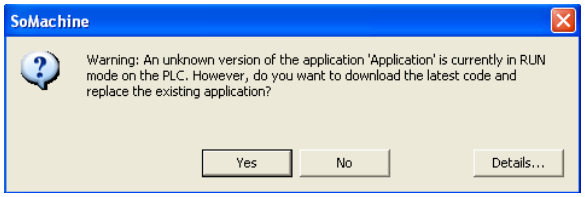
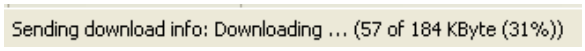
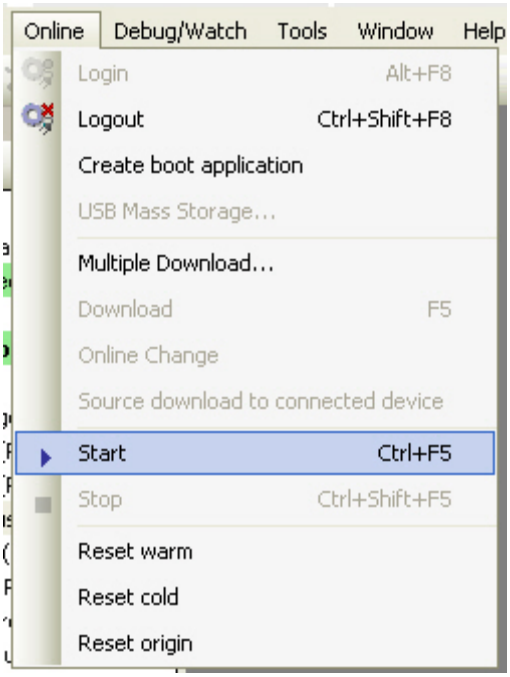
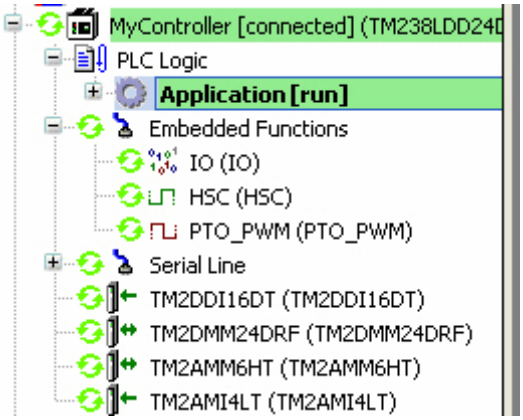
2	In Vijeo Designer, select the target name (**HMISTU655**) in the Navigator to display the setting tabs. In the setting tab **General** select **Download** via **USB**. **Note:** The PC must be connected to the HMI via the cable **XBTZG935**.	
3	Select: **Build → Download All**	
4	The **VDPLoad** dialog indicates that the runtime version does not match. Start the download of the new version via clicking on **Yes**.	

5	The actual state of the download is displayed in a progress bar.	
6	Once the runtime download is complete, change the **Download** connection in the setting tab **General** back to **SoMachine.**	
7	To download the application to the controller and the HMI change to the **Online** tab and select: **Multiple Download…**	
8	Check the controller (**MyController)** and the HMI **(XBTGT2330), Always perform a full download** and click on **OK**.	

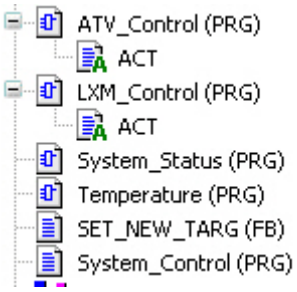
9	Before the download starts, a build of the complete project is done. The result of the build is displayed in the **Messages** window.	
10	The results of the download to the controller are displayed in the **Multiple Download – Result** window**.** Here are two examples: In the first dialog, there was downloaded. And in the second dialog, the application was created and downloaded. Click on **Close** to close to the results window**.**	 
11	Once the download to the controller is finished, the HMI download starts.	
12	The result of the HMI download is displayed in the **Messages** window.	

Login to controller

1	To login to the M238 click **Online→** **Login**	

2	SoMachine will display a message according to the state of the M238 you are trying to login to. Here are two examples: In the first dialog, there is no program in the device. And in the second dialog, the controller program is different from the program on the PC. In both cases, you are asked to confirm whether to proceed with the download of the PC program into the controller. If you do not wish to overwrite the controller program, skip to step 6, otherwise click **Yes** to confirm the download.	 
3	The actual download status is displayed at the bottom left of the main window.	
4	To start running the Application in the controller, select **Online →** **Start**	
5	If everything is operating normally the devices and folders are marked in green otherwise they will be marked in red.	

Application overview

1	The picture on the right shows the structure of the program.	

HMI

Introduction

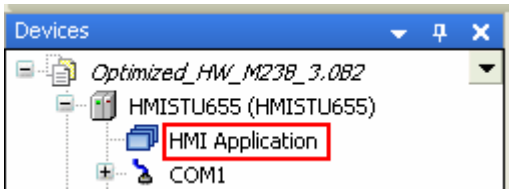
This application uses a HMI device of type Magelis HMI STU655. The HMI communicates with the controller using SoMachine protocol over serial port (RS485). The Magelis is programmed using the software tool **Vijeo Designer** (Delivered with SoMachine) that is described briefly in the following pages. For the connection between the controller and the HMI, the cable **XBTZG935** is used.

Note:
The Vijeo Designer Tool is opened via SoMachine. For more information see **Controller** chapter**, Add Vijeo Designer HMI**

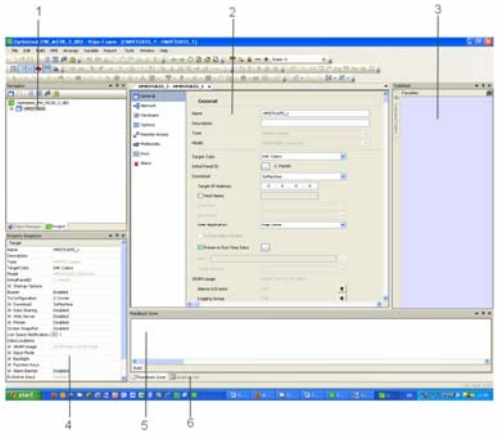
Setting up the HMI is done as follows:

- Main Window
- Settings –General, -Network
- Communication settings
- Create a Switch
- Create a Numeric Display
- Example Screens

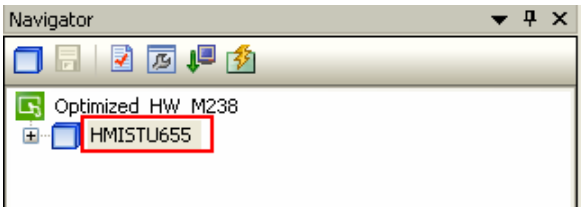
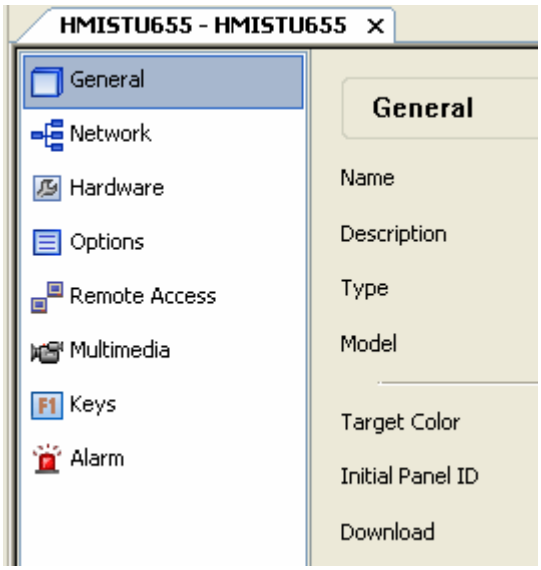
Open Vijeo Designer

1	To open the visualization tool Vijeo Designer, double click on **HMI Application** in the Device tab.	

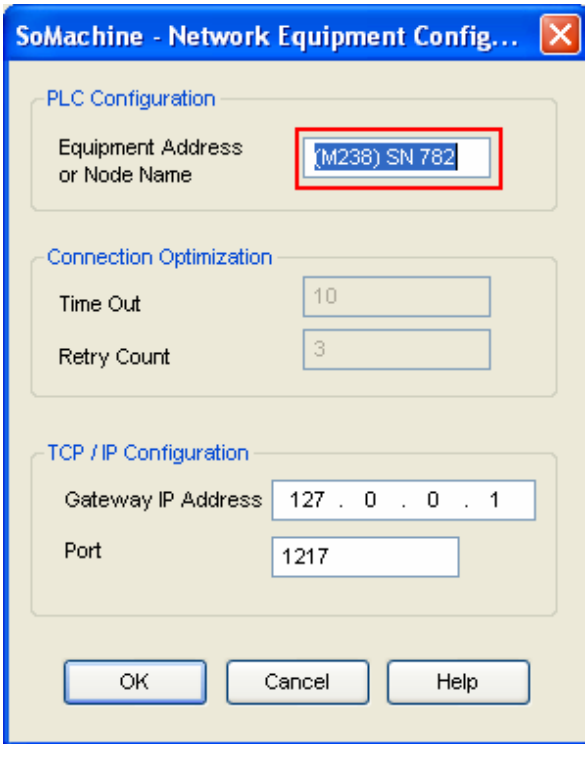
Main Window

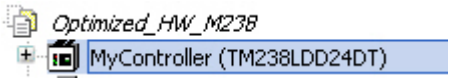
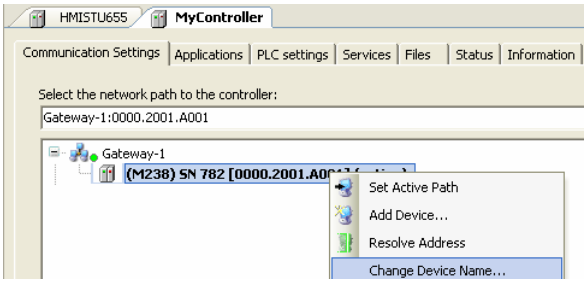
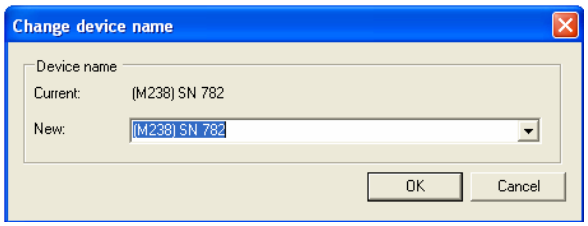
2	After creating a Vijeo Designer HMI program in SoMachine the target view Window of Vijeo Designer is displayed. Vijeo Designer has the following components: 1. Navigator 2. InfoViewer 3. Toolchest 4. Property Inspector 5. Feedback Zone 6. Graphic List tab	

Settings

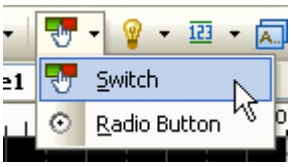
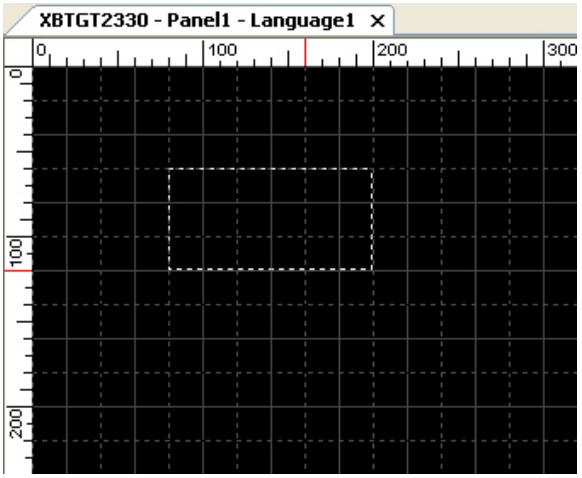
1	To open the settings double click on the device name (**HMISTU655**) in the **Navigator.** On the setting tabs (**General, Network, Hardware, Options, Remote Access, Multimedia, Keys and Alarm**) it is possible to change the basic settings for the visualization or to set parameters. Here the default setting are used: No change is necessary.	 

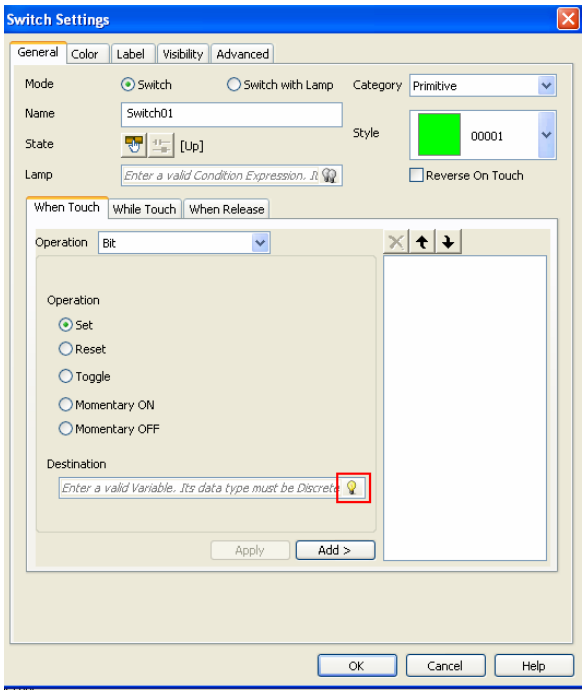
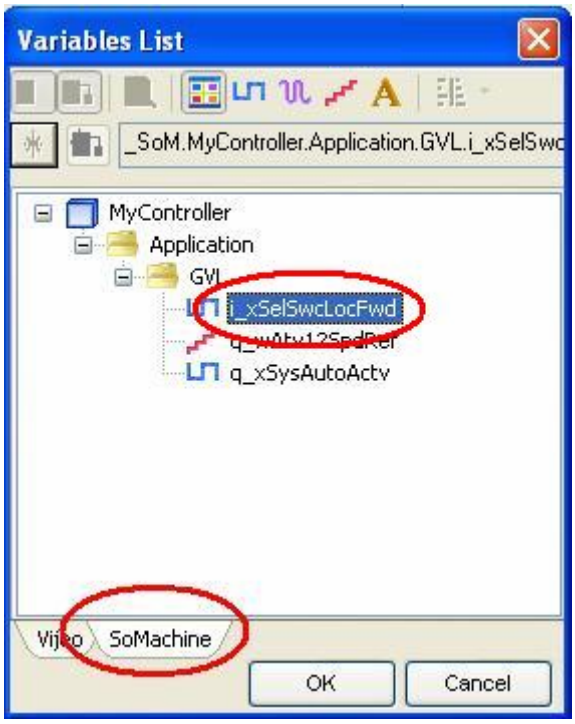
Communi-cation settings

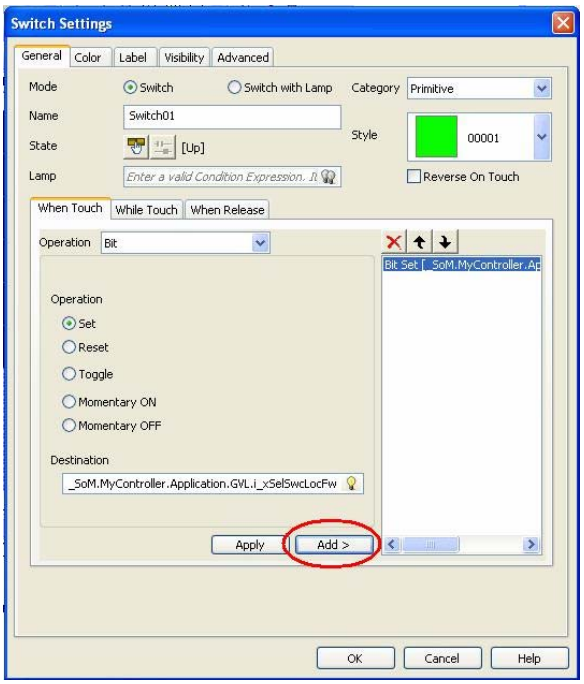
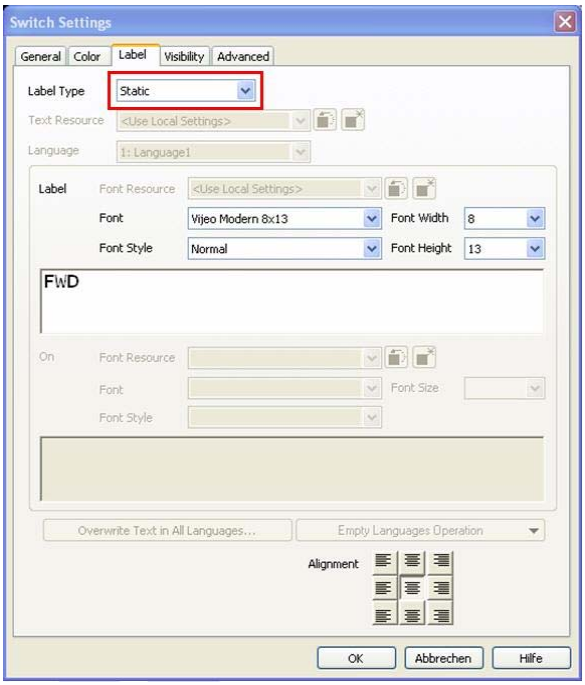
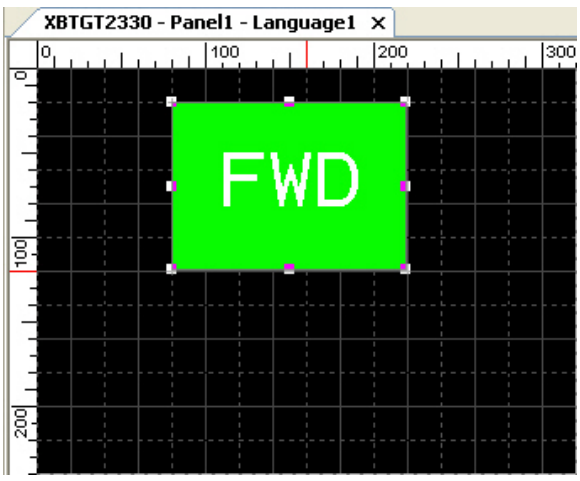
1	To set the communication parameters select in the **Navigator** → **IO Manager** → **SoMachineNetwork01** → double click on **SOM_MyController**	
2	In the **SoMachine – Network Equipment Config…** dialog set the controller **Equipment Address.** You will find this address in SoMachine…	

3	… by double clicking the **MyController** in the SoMachine project browser.	
4	..In the **Communication Settings** Tab select the controller and select by using the right mouse key Change Device Name	
5	..The Equipment address or an alias for the controller is now displayed in the **Change Device Name** box	

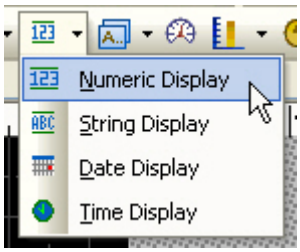
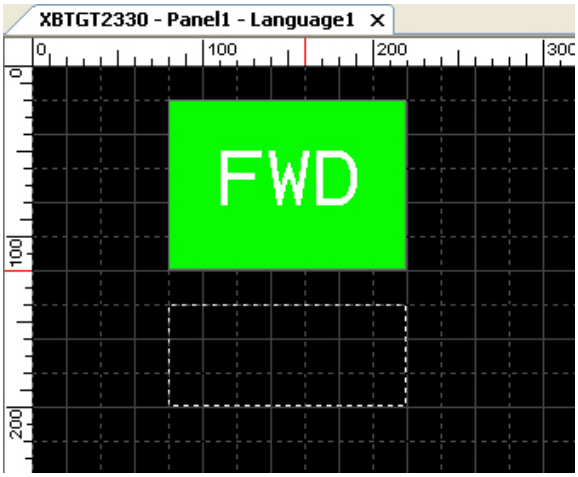
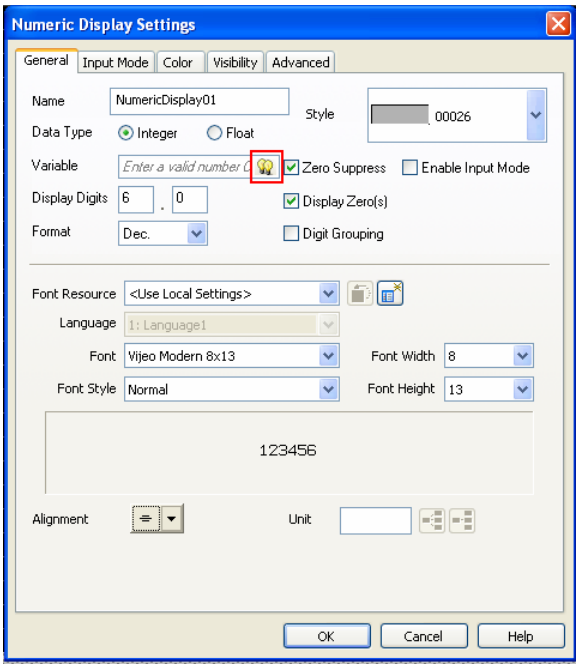
Create a Switch

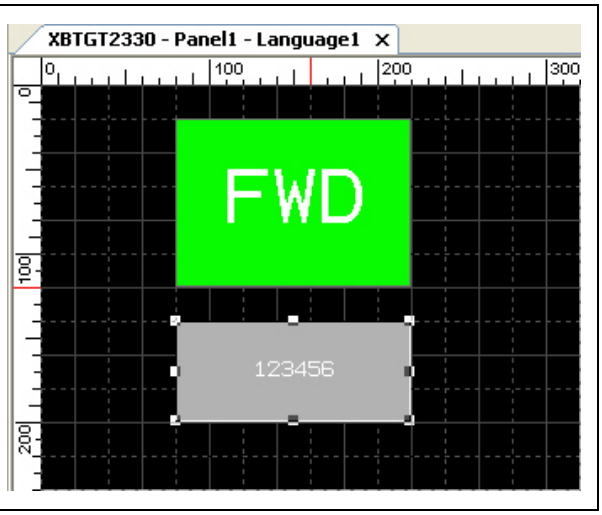
1	Click on the **Switch** icon in the toolbar.	
2	Click on the panel where you wish to position the switch and then drag the cursor to size it. Then click again or press enter.	

3	In the **Switch Settings** dialog, under the tab General, click on the bulb icon at the **Destination** field to select the variable that should be linked to the switch.	
4	In the **Variables List** dialog that opens, select **SoMachine** and an imported variable (e.g. i_xSelSwcLocFwd) Click **OK.**	

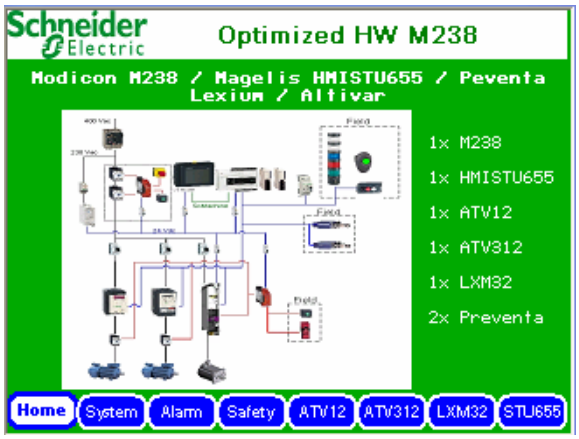
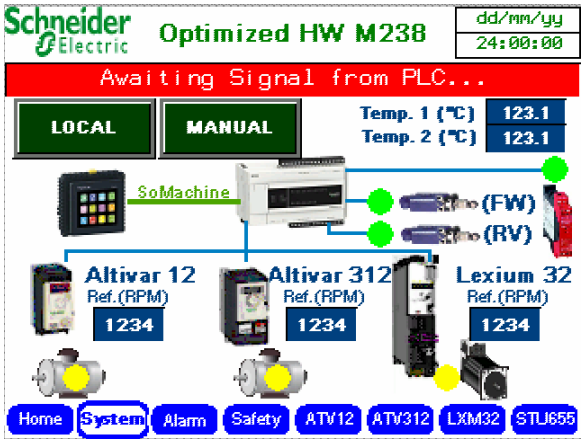
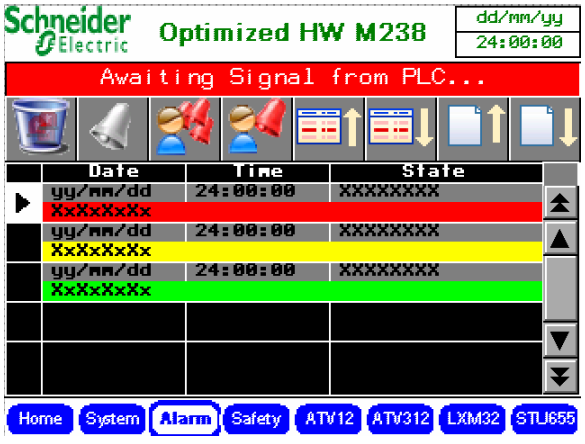
5	After the variable has been selected as the switch's **Destination**, click on **Add >**.	
6	In the **Label tab,** select **Static** as the **Label Type** and enter a name that the switch would be labeled with, e.g. FWD. If you wish, you can modify the label's Font attributes (Style, Width, Height and Alignment). When you are satisfied with the switch settings, click on **OK**.	
7	The new switch in now on the Work frame.	

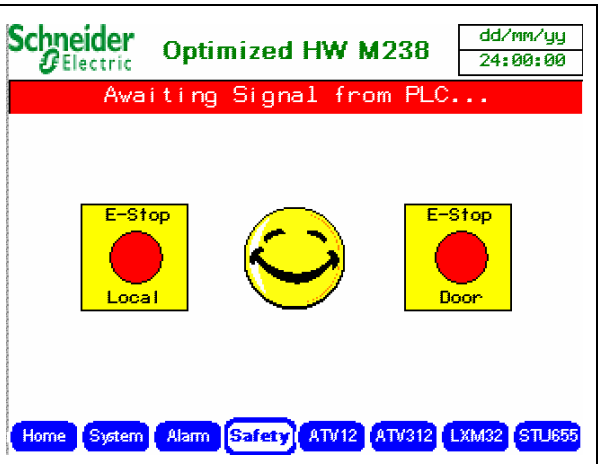
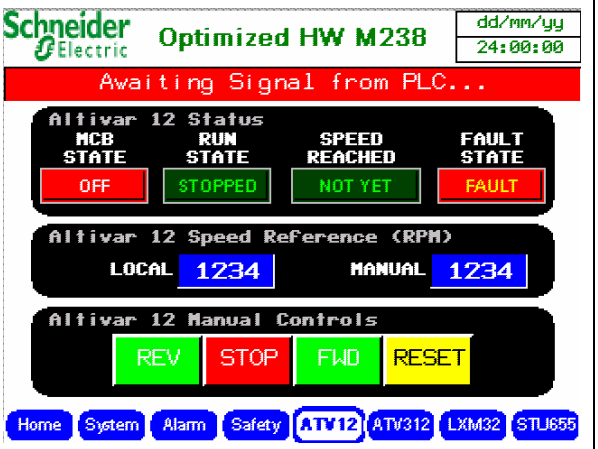
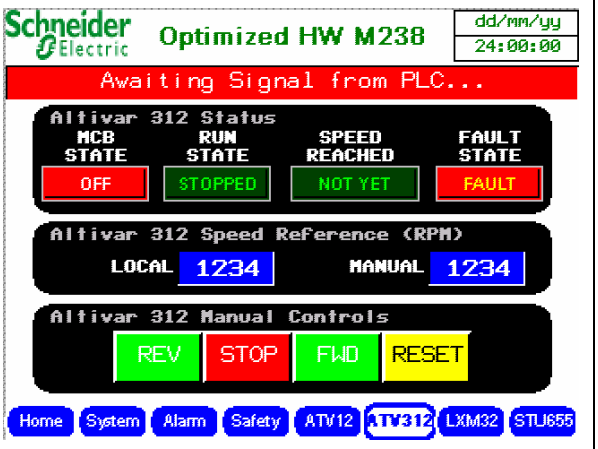
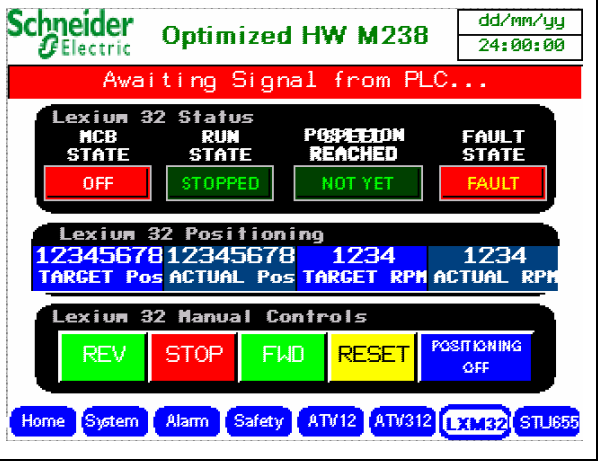
Create a Numeric Display

1	Click on the **Numeric Display** icon in the toolbar.	
2	Click on the panel where you wish to position the numeric display and then drag the cursor to size it. Then click again or press enter.	
3	In the **Numeric Display Settings** dialog, under the tab **General**, click on the bulb icon at the **Variable** field to select the variable that should be linked to the display. In **Display Digits**, the maximum number of digits to be displayed for the integral and fractional part of the value can be set.	

4	The new numeric display is now on the Work frame.	

Example Screens

1	The **Home** page of the HMI displays shows a picture of the complete architecture.	
2	The **System** page has two functions: 1. To show the overall status for all devices and the temperature. 2. To select between LOCAL or MANUAL operation mode.	
3	The **Alarm** page shows the status of the system alarms and logs them chronologically.	

4	The “**Safety**” page shows the status of the emergency stop relay.	
5	The **ATV12** page is for setting the speed references of the ATV12 drive and controlling the drive when the system is operating in Manual mode. It also displays the status of the drive.	
6	The **ATV312** page is for setting the speed references of the ATV312 drive and controlling the drive when the system is operating in Manual mode. It also displays the status of the drive.	
7	The **LXM32** page is for setting the speed references of the LXM32 drive and controlling the drive in either speed or position mode when the system is operating in Manual mode. It also displays the status of the drive.	

8	The **STU655** page allows to switch to the HMI system configuration menu.	

Devices

Introduction

This chapter describes the steps required to initialize and configure the different devices required to attain the described system function.

General

Altivar 12, Altivar 312 and Lexium 32C drives are configured by using the local control panel on the device itself.

Note

If this is not a new drive you should re-establish the factory settings. If you need instructions on how to do this, please read the drive documentation.

Be sure that the controller is in STOP state before parameterizing the drives.

Altivar 12

Introduction

The ATV12 parameters can be entered or modified via the local control panel on the front of the device itself.

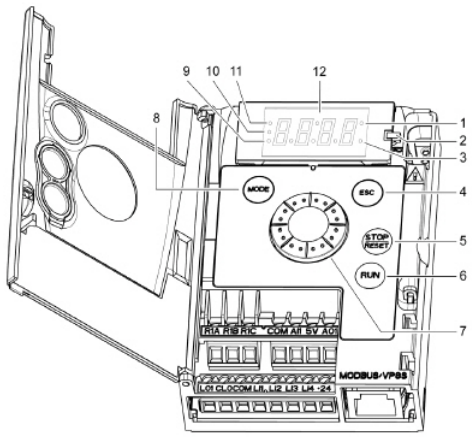
Note

If this is not a new drive you should re-establish the factory settings. If you need instructions on how to do this, please read the drive documentation.

The Jog dial that is a part of the local control panel can be used for navigation by turning it clockwise or counter-clockwise. Pressing the jog dial enables the user to make a selection or confirm information.

Control panel

1 The configuration of the Altivar can be done by using the buttons and the jog dial on the control panel of the Altivar.

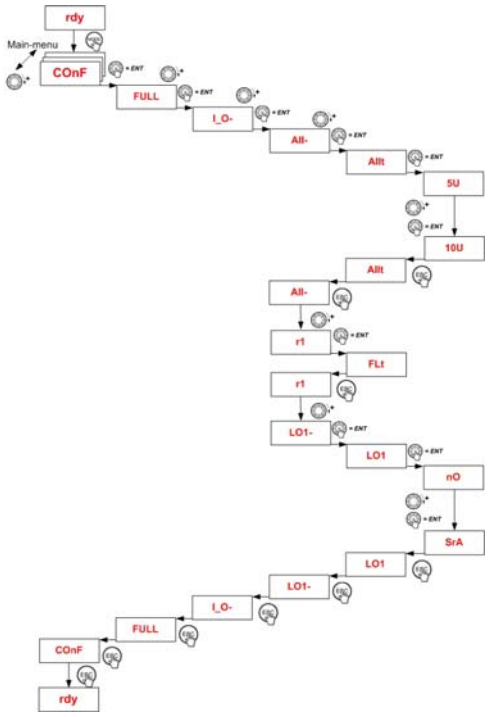


1. Value LED (a) (b).
2. Charge LED
3. Unit LED (c)
4. ESC button: Exits a menu or parameter, or aborts the displayed value to return to the previous value in the memory.
5. STOP button: stops the motor (could be hidden by door if function disabled). **Important: See instructions for "RUN/STOP" cover removal.**
6. RUN button: Starts running if the function is configured (could be hidden by door if function disabled).
7. Jog dial
   - Acts as a potentiometer in local mode.
   - For navigation when turned clockwise or counterclockwise
   - and selection / validation when pushed. This action is represented by this symbol

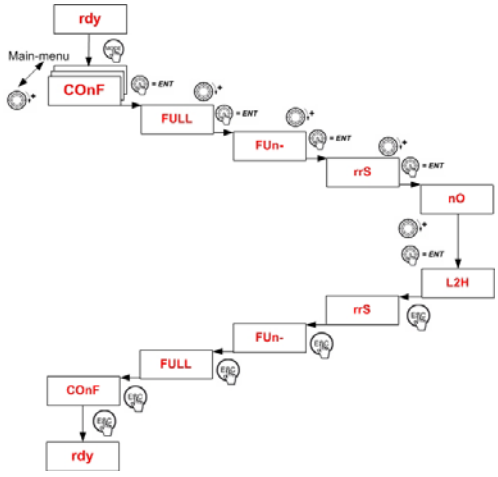
8. MODE button
   Switches between the control/programming modes. The MODE button is only accessible with the HMI door open.
9. CONFIGURATION mode LED (b)
10. MONITORING mode LED
11. REFERENCE mode LED
12. Four "7-segment" displays

(a) If illuminated, indicates that a **value** is displayed, for example, 0.5 is displayed for "0.5"
(b) When changing a value the Configuration mode LED and the value LED are on steady.
(c) If illuminated, indicates that a unit is displayed, for example, AMP is displayed for "Amps"

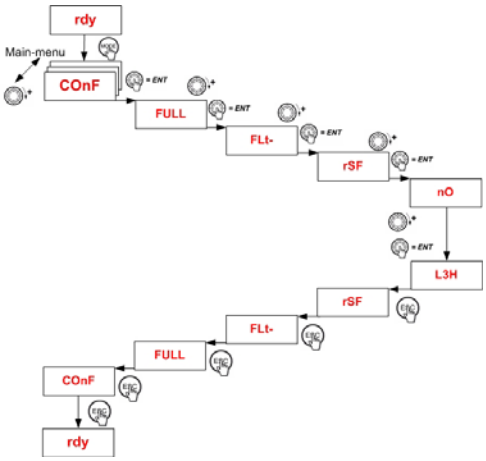
Inputs / Outputs configuration

1	To assign the inputs and outputs: ➔ Press **MODE** ➔ Select **COnF** and press enter ➔ Select **FULL** and press enter ➔ Select **I_O-** [INPUTS / OUTPUTS CFG] and press enter ➔ Select **All-** and press enter ➔ Select **AIIt** (Analog input 1)and press enter ➔ Select **10U** (0-10V) and press enter ➔ Return to **AIIt** with **ESC** ➔ Return to **All-** with **ESC** ➔ Select **r1** (relay output 1) and press enter ➔ Select **FLt** (No Fault) and press enter ➔ Return to **r1** with **ESC** ➔ Select **LO1-** and press enter ➔ Select **LO1** (Logic output 1) and press enter ➔ Select **SrA** (Speed reached) and press enter ➔ Return to **LO1** with **ESC** ➔ Return to **LO1-** with **ESC** ➔ Return to **I_O-** with **ESC** ➔ Return to **FULL** with **ESC** ➔ Return to **ConF** with **ESC** ➔ Return to **rdy** with **ESC**	

Set Input for reverse function

1	To assign the input for the reverse function input: ➔ Press **MODE** ➔ Select **ConF** and press enter ➔ Select **FULL** and press enter ➔ Select **Fun-** [APPLICATION FUNCT.] and press enter ➔ Select **rrS** (Reverse input) and press enter ➔ Select **L2H** (Logic input 2) and press enter ➔ Return to **rrS** with **ESC** ➔ Return to **Fun-** with **ESC** ➔ Return to **FULL** with **ESC** ➔ Return to **ConF** with **ESC** ➔ Return to **rdy** with **ESC**	

Fault management

1	To assign the settings for Fault management: ➔ Press **MODE** ➔ Select **ConF** and press enter ➔ Select **FULL** and press enter ➔ Select **FLt-** [FAULT-MANAGEMENT] and press enter ➔ Select **rSF** (Reset Fault) and press enter ➔ Select **L3H** (Logic input 3) and press enter ➔ Return to **rSF** with **ESC** ➔ Return to **FLt-** with **ESC** ➔ Return to **FULL** with **ESC** ➔ Return to **ConF** with **ESC** ➔ Return to **rdy** with **ESC**	

Power cycle

1	For the drive to operate with the new parameters, a power cycle (on, off, on) is required.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

After making any configuration changes or adjustments, be sure to cycle power (remove and reapply power) on the drive.

Failure to follow these instructions can cause death, serious injury or equipment damage.

Altivar 312

Introduction

The ATV312 parameters can be entered or modified via the local control panel on the front of the device itself.

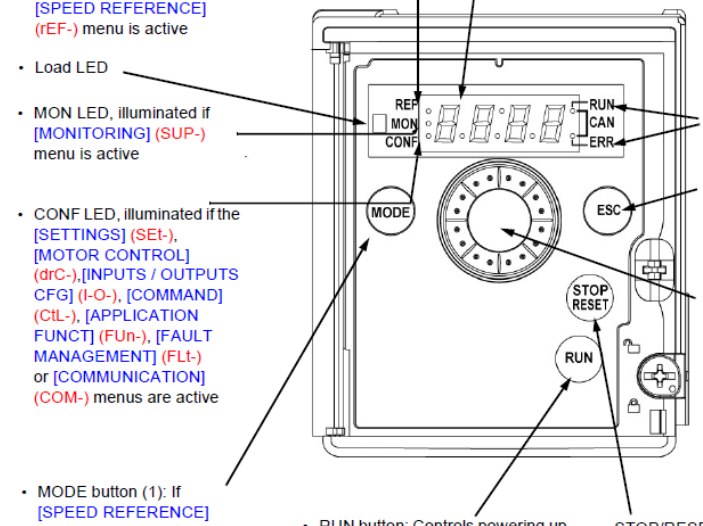
Note

If this is not a new drive you should re-establish the factory settings. If you need instructions on how to do this, please read the drive documentation.

The Jog dial that is a part of the local control panel can be used for navigation by turning it clockwise or counter-clockwise. Pressing the jog dial enables the user to make a selection or confirm information.

Control panel

1	The configuration of the Altivar can be done by using the buttons and the jog dial on the control panel of the Altivar.

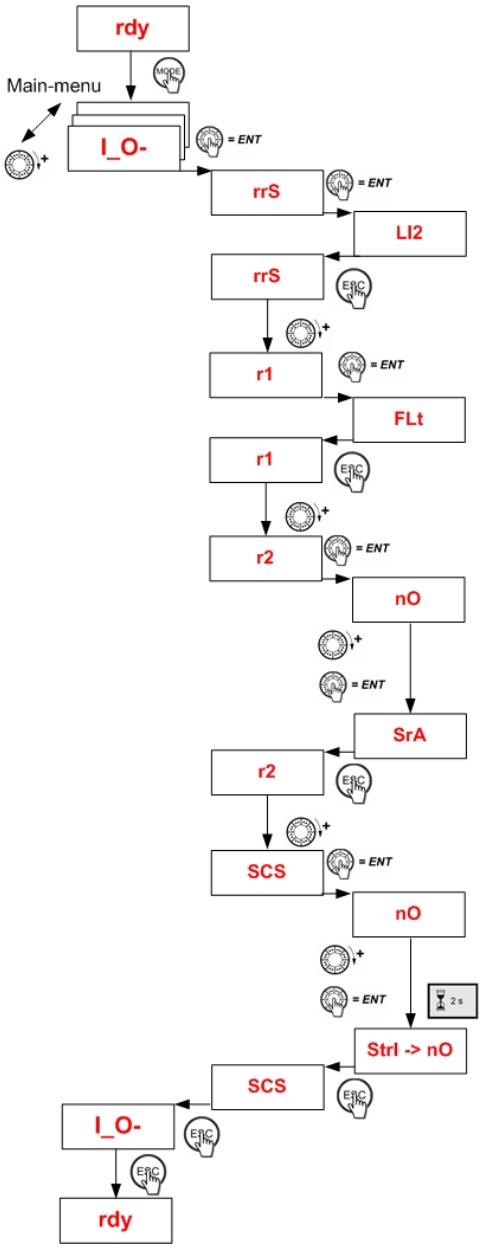


- REF LED, illuminated if [SPEED REFERENCE] (rEF-) menu is active
- Load LED
- MON LED, illuminated if [MONITORING] (SUP-) menu is active
- CONF LED, illuminated if the [SETTINGS] (SEt-), [MOTOR CONTROL] (drC-),[INPUTS / OUTPUTS CFG] (I-O-), [COMMAND] (CtL-), [APPLICATION FUNCT] (FUn-), [FAULT MANAGEMENT] (FLt-) or [COMMUNICATION] (COM-) menus are active
- MODE button (1): If [SPEED REFERENCE] (rEF-) is displayed, this will take you to the [SETTINGS] (SEt-) menu. If not, it will take you to the [SPEED REFERENCE] (rEF-) menu.
- 4 x 7 segment display
- 2 CANopen status LEDs
- Used to quit a menu or parameter or to clear the value displayed in order to revert to the value in the memory
- Jog dial - can be used for navigation by turning it clockwise or counter-clockwise - pressing the jog dial enables the user to make a selection or confirm information. = *ENT*

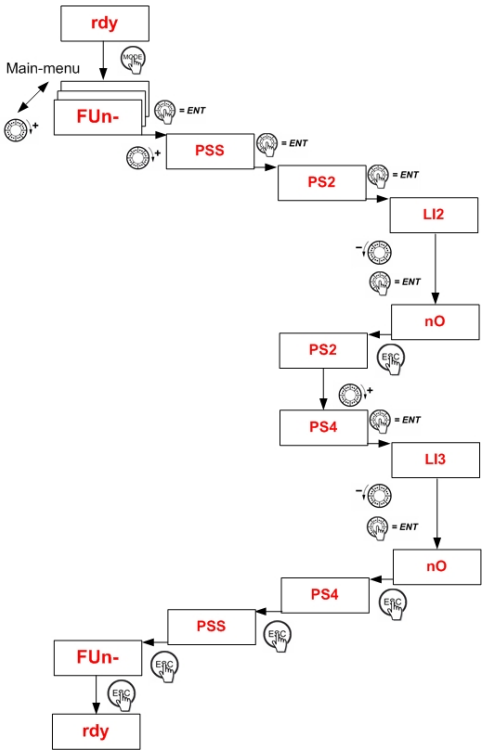
  Functions as a potentiometer if [Ref.1 channel] (Fr1-) in the [COMMAND] (CtL-) menu is set to [Image input AIV1] (AIV1)
- RUN button: Controls powering up of the motor for forward running if the [2/3 wire control] (tCC) parameter in the [INPUTS / OUTPUTS CFG] (I-O-) menu is set to [Local] (LOC), page 45

STOP/RESET button
- Enables detected fault to be reset
- Can be used to control motor stopping
  - If [2/3 wire control] (tCC) is not set to [Local] (LOC), freewheel stop
  - If [2/3 wire control] (tCC) is set to [Local] (LOC), stop on ramp or freewheel stop during DC injection braking

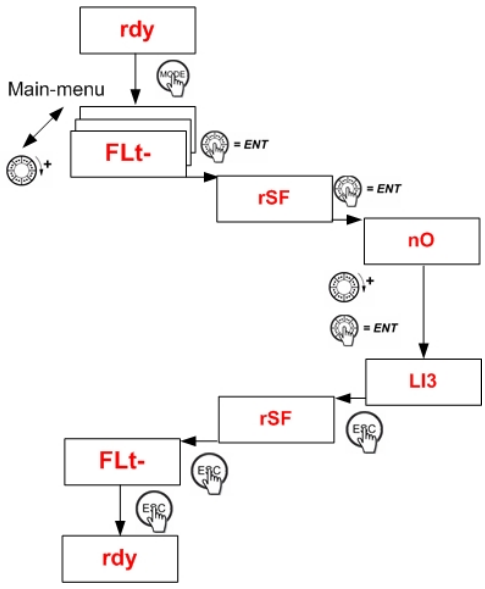
Inputs / Outputs configuration

1	To assign the inputs and outputs: ➔ Press **MODE** ➔ Select **I_O-** [INPUTS / OUTPUTS CFG] and press enter ➔ Select **rrS** (Reverse input assignment) and press enter ➔ **LI2** (factory setting) ➔ Return to **rrS** with **ESC** ➔ Select **r1** (relay output 1) and press enter ➔ **FLt** (No Drive Fault, factory setting) ➔ Return to **r1** with **ESC** ➔ Select **r2** (relay output 2) and press enter ➔ Select **SrA** (Speed Reached) and press enter ➔ Return to **r2** with **ESC** ➔ Select **SCS** (Save configuration) and press enter ➔ Select **Strl** and press enter for 2 seconds ➔ **SCS** automatically switches to **nO** as soon as the as the save has been performed. ➔ Return to **SCS** with **ESC** ➔ Return to **I_O-** with **ESC** ➔ Return to **rdy** with **ESC**	

Change settings for Preset Speeds

1	To assign the settings for Preset Speeds: ➔ Press **MODE** ➔ Select **Fun-** [APPLICATION FUNCT.] and press enter ➔ Select **PSS** and press enter ➔ Select **PS2** and press enter ➔ Select **nO** and press enter ➔ Return to **PS2** with **ESC** ➔ Select **PS4** and press enter ➔ Select **nO** and press enter ➔ Return to **PS4** with **ESC** ➔ Return to **PSS** with **ESC** ➔ Return to **Fun-** with **ESC** ➔ Return to **rdy** with **ESC** The reason for this modification is: in this Application we do not use the Preset Speeds and we use the Input LI3 for RSF (Fault Reset)	

Fault management

1	To assign the settings for Fault management: ➔ Press **MODE** ➔ Select **FLt-** [FAULT-MANAGEMENT] and press enter ➔ Select **rSF** (Reset Fault) and press enter ➔ Select **LI3** and press enter ➔ Return to **rSF** with **ESC** ➔ Return to **FLt-** with **ESC** ➔ Return to **rdy** with **ESC**	

Power cycle

1	For the drive to operate with the new parameters, a power cycle (on, off, on) is required.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

After making any configuration changes or adjustments, be sure to cycle power (remove and reapply power) on the drive.

Failure to follow these instructions can cause death, serious injury or equipment damage.

Introduction

The LXM32C parameters can be entered or modified via using the local control panel on the front of the device itself.

Note

If this is not a new drive you should re-establish the factory settings. If you need instructions on how to do this, please refer to the drive documentation.
If the drive is being started for the first time, the **Fsu** (First Setup) is invoked.

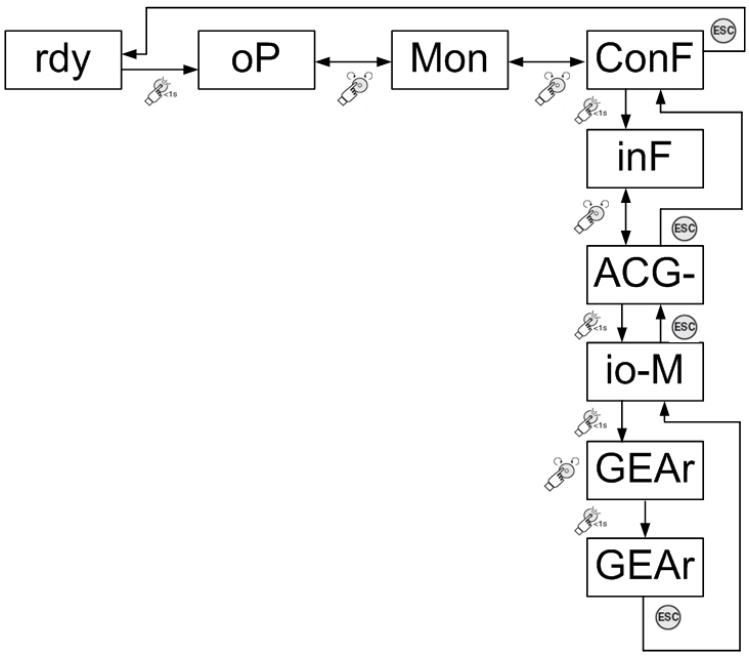
Select the operating mode

1 Selection of the operating mode: **GEAr** (Electronic Gear).

The parameter “IOdefaultMode” (**io-M**) is used to set the desired operating mode.

The selected operating mode is starting by enabling the power stage.

► Set the operating mode with the parameter “IOdefaultMode” (**io-M**).



Parameter name HMI menu HMI name	Description
IOdefaultMode ConF → ACG- , o-M	Operating mode 0 / None / nonE: None **1 / Profile Torque /** tor9: Profile Torque **2 / Profile Velocity /** VELP: Profile Velocity **3 / Electronic Gear /** GEAr: Electronic Gear **5 / Jog /** JoG: Jog Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.

2	For the drive to operate with the new parameters, a power cycle (on, off, on) is required.

⚠ WARNING

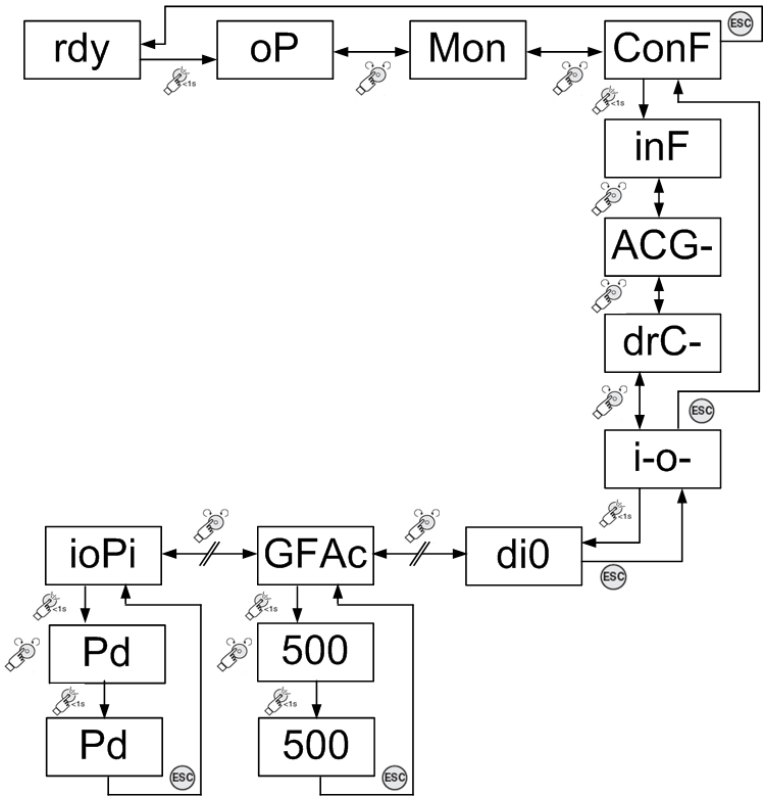
UNINTENDED EQUIPMENT OPERATION

After making any configuration changes or adjustments, be sure to cycle power (remove and reapply power) on the drive.

Failure to follow these instructions can cause death, serious injury or equipment damage.

Settings for the gear ration and PTI-signal

1 Selection of the gear ratio (**500**) and signal type for PTI interface: (**Pd**).
The parameter “GEARratio” (**GFAc**) is used to set the gear ratio. The parameter “PTI_signal_type” (**ioPi**) is used to set the signal type for the PTI interface.
► Set the signal type with the parameter “GEARratio” (**GFAc**).
► Set the signal type with the parameter “PTI_signal_type” (**ioPi**).



Parameter name HMI menu HMI name	Description
GEARratio ConF → i-o- GFAC	Selection of special gear ratios 0 / Gear Factor / FAct: Usage of gear ratio adjusted with GEARnum/GEARdenom **1 / 200 /** 200: 200 **2 / 400 /** 400: 400 **3 / 500 /** 500: 500 **4 / 1000 /** 1000: 1000 **5 / 2000 /** 2000: 2000 **6 / 4000 /** 4000: 4000 **7 / 5000 /** 5000: 5000 **8 / 10000 /** 10.00: 10000 **9 / 4096 /** 4096: 4096 **10 / 8192 /** 8192: 8192 **11 / 16384 /** 16.38: 16384 A change of the reference value by the specified value causes one motor revolution. Changed settings become active immediately.
PTI_signal_type ConF → i-o- i oPi	Selection of signal type for PTI interface 0 / A/B Signals / Ab: Signals ENC_A and ENC_B (quadruple evaluation) **1 / P/D Signals /** Pd: Signals PULSE and DIR **2 / CW/CCW Signals /** cucc: Signals CW and CCW Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.

2	For the drive to operate with the new parameters, a power cycle (on, off, on) is required.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

After making any configuration changes or adjustments, be sure to cycle power (remove and reapply power) on the drive.

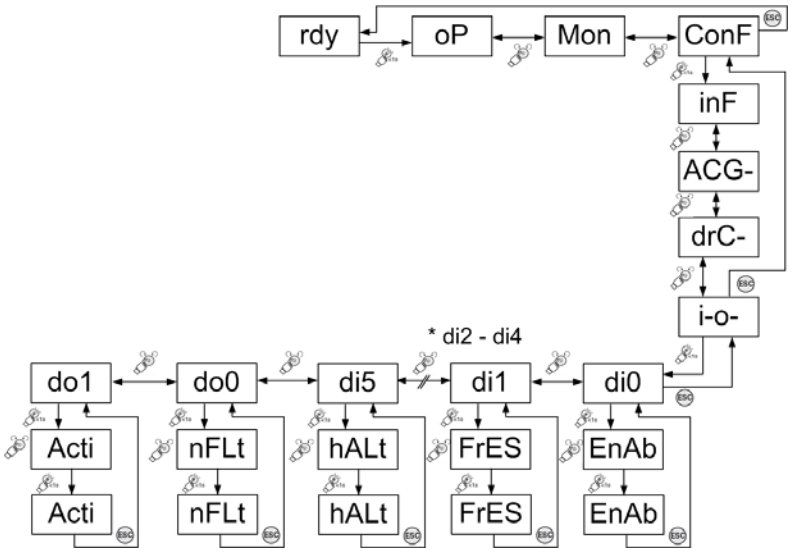
Failure to follow these instructions can cause death, serious injury or equipment damage.

Inputs / Outputs configuration

1

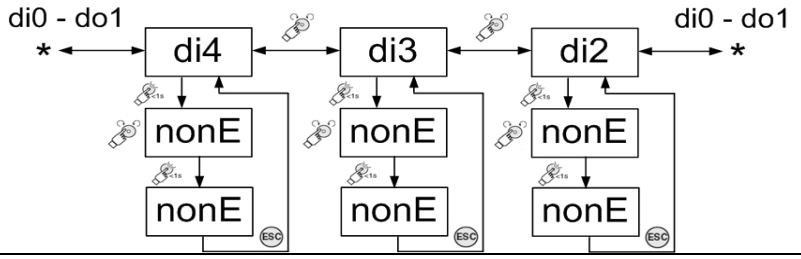
Configuration of the digital inputs **di0, di1, di5** and digital outputs **do0, do1**.
► **di0** → **EnAb** Enables the power stage
► **di1** → **FrES** Fault reset after error
► **di5** → **hALt** Stopping movement with Halt
► **do0** → **nFLt** Ready to switch on
► **do1** → **Acti** Operation Enable

The digital inputs **di2 – di4** are not used. It is required to set this inputs to **nonE**.
► **di2** → **nonE**
► **di3** → **nonE**
► **di4** → **nonE**



Parameter name HMI menu HMI name	Description
IOfunct_DI0 ConF → i-o- di0	Function Input DI0 1 / Freely Available / nonE: Available as required **2 / Fault Reset / FrES**: Fault reset after error **3 / Enable / EnAb**: Enables the power stage

Parameter name HMI menu HMI name	Description
IOfunct_DQ0 ConF → i-o- do0	Function Output DQ0 1 / Freely Available / nonE: Available as required **2 / No Fault / nFLt**: Signals operating states Ready To Switch On, Switched On and Operation Enable **3 / Active / Act**: Signals operating state Operation Enable



Power cycle

1	For the drive to operate with the new parameters, a power cycle (on, off, on) is required. In case of display **"nrdy"** instead of **"rdy"**, a power cycle (on, off, on) is also required.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

After making any configuration changes or adjustments, be sure to cycle power (remove and reapply power) on the drive.

Failure to follow these instructions can cause death, serious injury or equipment damage.

Wireless pushbutton

General

The initialization and configuration of the wireless pushbuttons is done using the integrated pushbuttons on the receiver module.

Setting up the wireless pushbuttons is done as follows:

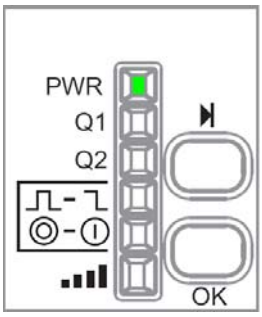
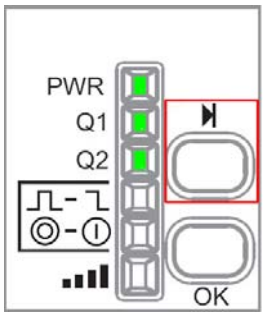
- Entering teach mode for pushbuttons
- Select output 1
- Activate output 1
- Teach in new pushbutton
- Un-teach pushbutton
- Entering teach mode for output behavior
- Select output 1
- Change behavior to bistable outputs

Requirements

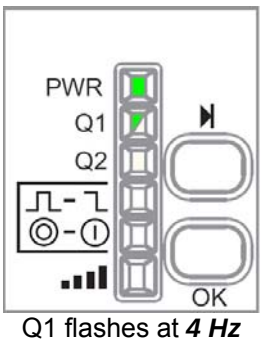
Before starting work with the wireless pushbuttons the following conditions must be fulfilled:

- The receiver module is connected to the power supply
- The wireless pushbutton (transmitter) is in reach of the receiver module.

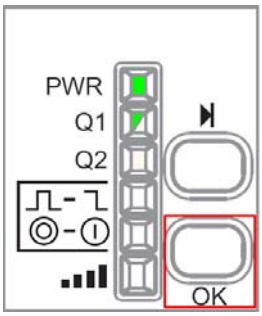
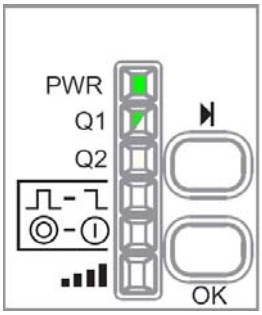
Entering teach mode for pushbuttons

1	The powered module offers two different teach modes ▪ **Teaching/unteaching of pushbuttons** ▪ **Changing of output** behavior	
2	Enter the teaching mode for new pushbuttons by pressing the upper arrow key for approximately 3 seconds. During the time the key is pressed and the receiver is not in teach mode the indicator lamps **Q1** and **Q2** are switched on (green). Release the key when only the **Q1** indicator lamp on the device starts flashing green.	

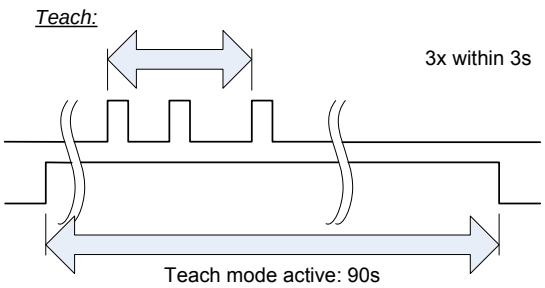
Select Output 1

1	In this phase the **Q1** lamp flashes fast (at 4 Hz). To switch between **output 1** and **output 2** press the **arrow key**. To switch back to **output 1** press the arrow key once again. For **output 1** there is no need to switch over by the arrow key for selecting **Q1**.	 Q1 flashes at ***4 Hz***

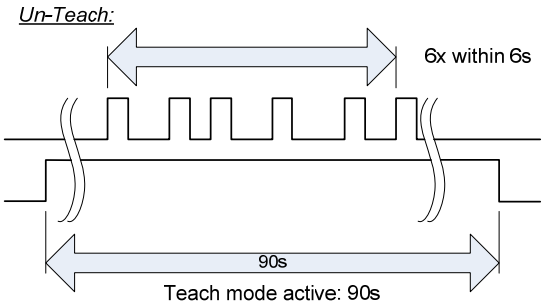
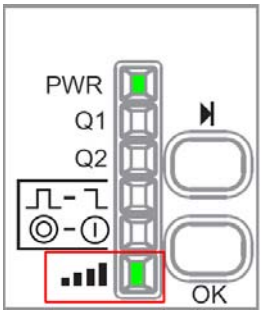
Activate Output 1

1	Verify that the **Q1** lamp still flashes at 4 Hz. Press the **OK** button one time to activate the output 1 for teaching.	
2	The receiver unit is now ready to receive the commands for teaching or un-teaching of a pushbutton for output 1 within the next 90s. **Note:** If the timelimit of 90 seconds will be exceeded without any action, the module will leave the teach mode automatically	 Q1 **flashes at *2 Hz***

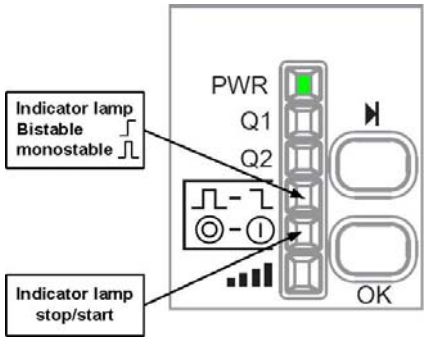
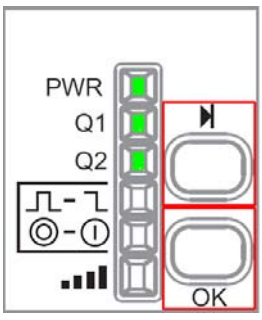
Teach in new pushbutton

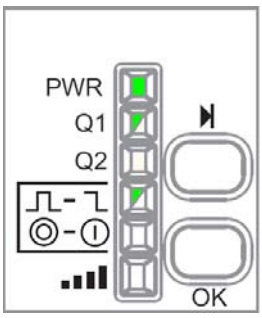
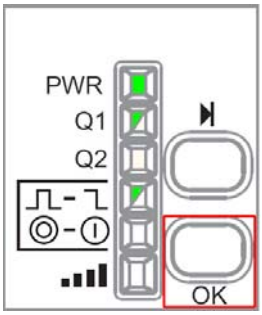
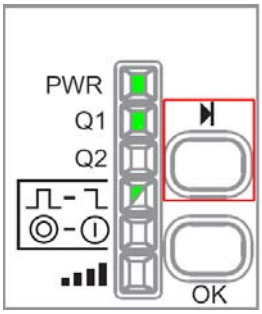
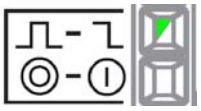
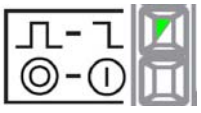
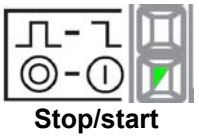
1	Teach-in a new pushbutton: Click the pushbutton 3 times within 3 seconds	

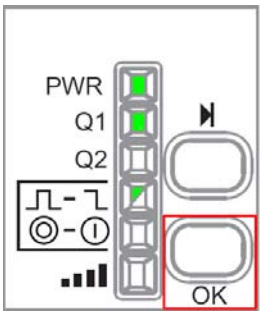
Un-teach pushbutton

1	Un-teach a pushbutton Click the pushbutton 6 times within 6 seconds	
2	After the teaching or un-teaching of pushbutton has been completed the module turns on the **transmission indicator lamp** at the bottom of the receiver unit and leaves the teach mode automatically. To teach a pushbutton for **output 2** repeat the steps for **Activate Output 1** and **Teach-in new pushbutton** with the settings for output 2 accordingly.	

Entering teach mode for output behavior

1	The reciver module allows three different settings of output behavior. These function modes are ▪ **Monostable** ▪ **Bistable** ▪ **Stop/start** The selected one for this example is the bistable mode.	
2	Enter the teaching mode for changing the output behavior by pressing the **arrow** and the **OK key** at the same time for for **approximately 3 seconds**. During the time the keys remain pressed (and the receiver is not yet in teach mode) the indicator lamps **Q1** and **Q2** are switched on additionally. Release the keys when the **Q1** indicator lamp and at least one of the function mode indicator lamps (bi-/ monostable or stop/start) on the device are flashing.	

Select Output 1	**1**	In this phase the **Q1** lamp flashes fast (at 4 Hz). To switch between **output 1** and **output 2** press the **arrow key**. To switch back to **output 1** press the arrow key once again. For **output 1** there is no need to switch over by the arrow key for selecting **Q1**.	
	2	Verify that the **Q1** lamp still flashes. Press the **OK** button on etime to activate **output 1** for teaching.	
Change behavior to bistable outputs	**3**	The **Q1** lamp is permanently switched on and indicates that selection of the **output 1** has been made. The function mode of the **output 1** can be switched by pressing the **arrow key**. These functions can be switched in a fixed sequence: - **Monostable** - **Bistable** - **Stop/start** These modes will be indicated by the status LEDs on the device.	
		Monostable Upper LED flashes 2 times, followed by a break	Monostable 
		Bistable Upper LED flashes 4 times, followed by a break	Bistable 
		Stop/start Lower LED flashes continuously	 **Stop/start**

4	In this example the bistable output behavior will be selected. To do this verify that the status LED for the bistable mode flashes two times followed by a break. Confirm the settings by pressing the **OK button** on the device. The device leaves the teach mode automatically. To modify the behavior of output 2 repeat the steps 2 to 4 accordingly.	

Appendix

Detailed Component List

Sarel Cabinet

Hardware-Components				
Pos.	**Qty**	**Description**	**Part Number**	**Rev./ Vers.**
1.1	1	Switch cabinet and mounting plate 1200 x 800 x 400 mm	NSYS3D12840P	
1.2	1	Cabinet light	NSYLAM75	
1.3	1	Wiring diagram pocket	NSYDPA4	
1.4	1	Thermostat 1NC 0-60 °C	NSYCCOTHO	
1.5	1	Fan with filter, 85m³/h 230 Vac,	NSYCVF85M230PF	
1.6	1	Air filter for cabinet, 250 x 250	NSYCAG125LPF	

Main Switch

Hardware-Components				
Pos.	**Qty**	**Description**	**Part Number**	**Rev./ Vers.**
2.1	1	Main switch 3pin 36 kA	LV429003	
2.2	1	Contact block TM16D	LV429037	
2.3	1	Terminal cover	LV429515	
2.4	1	Rotary drive with door interface	LV429340	

Power Supply

Optional

Hardware-Components				
Pos.	**Qty**	**Description**	**Part Number**	**Rev./ Vers.**
3.1	1	Power supply 230 Vac / 24 Vdc, 5 A, 120 W	ABL8RPS24050	
3.2	5	Circuit breaker C60 1P, 2A, C	23726	
3.3	1	Circuit breaker C60N 2P, 2 A, C	23747	
3.4	1	Circuit breaker C60H 2P, 3 A, D	24518	
3.5	1	Circuit breaker C60N 2P, 10 A, C	23756	
3.6	1	Earth disconnect terminal	5711016550	
3.7	1	Power supply 230 Vac / 24 Vdc, 5 A, 120 W	ABL4RSM24050	

HMI

Hardware-Components				
Pos.	**Qty**	**Description**	**Part Number**	**Rev./ Vers.**
4.1	1	Magelis STU655 HMI	HMISTU655	V6.0

Automation Components

Hardware-Components				
Pos.	**Qty**	**Description**	**Part Number**	**Rev./ Vers.**
5.1	1	Modicon M238 Logic Controller, 14 Digital Inputs, 10 Digital Outputs	TM238LDD24DT	V3.0
5.2	1	Option: Backup battery for M238 controller	TSXPLP01	
5.3	1	Digital input extension module, 16 Sink/Source inputs, 24 Vdc	TM2DDI16DT	
5.4	1	Digital input/output extension module, 8 inputs/ 16 outputs, 24 Vdc	TM2DMM24DRF	
5.5	1	Analog extension module 4 IN/2 OUT, 0 - 10 V / 4 - 20 mA	TM2AMM6HT	
5.6	1	Expansion module with 4 analog inputs, (0 - 10 Vdc, 0 - 20 mA, 3-wire Pt100, 3-wire Pt1000, 3-wire Ni100, 3-wire Ni1000), 12 bits, removable terminal block. (50 mA / 5 Vdc)	TM2AMI4LT	

Drives and Power

Hardware-Components				
Pos.	**Qty**	**Description**	**Part Number**	**Rev./ Vers.**
6.1	1	ATV12 variable speed drive 0.37 kW, 200/240 Vac	ATV12H037M2	V1.1IE01
6.2	1	ATV312 variable speed drive 0.37 kW, 380/500 Vac	ATV312H037N4	V5.0IE50
6.3	1	Lexium 32 servo drive, continuous output current 6 A RMS at 6000 RPM, 200/240 Vac	LXM32CD18M2	V01.06.06
6.4	1	Servo motor without brake, 0.5 Nm, 6000 RPM, 1.1 kW	BMH0702T06A2A	
6.5	2	Motor circuit breaker 2.5 A	GV2L07	
6.6	1	Motor circuit breaker 10 A	GV2L14	
6.7	3	Auxiliary contacts 1NO+1NC for circuit breaker	GVAE11	
6.8	2	Contactor 4 kW, 24 Vdc	LC1D09BD	
6.9	1	Power cable for Lexium 32, 3 m	VW3M5101R30	
6.10	1	Encoder cable for Lexium 32, 3 m	VW3M8101R30	
6.11	1	Signal cable for connecting PTI	VW3M8223R30	

Sensor

Hardware-Components				
Pos.	**Qty**	**Description**	**Part Number**	**Rev./ Vers.**
7.1	2	OsiSense Limit Switch	XCKP2118P16	

E-Stop

Hardware-Components				
Pos.	**Qty.**	**Description**	**Part Number**	**Rev./ Vers.**
8.1	1	Emergency Stop pushbutton, red-yellow	XB5AS844	
8.2	2	Safety Emergency Stop module	XPSAC5121	
8.3	1	Circular legend for Emergency Stop mushroom head pushbutton, 90 mm diameter	ZBY8330	
8.4	1	Auxiliary contacts for Emergency Stop	ZB5AZ141	
8.5	1	Guard Switch	XCSPA792	

Display and Indicators

Hardware-Components				
Pos.	**Qty.**	**Description**	**Part Number**	**Rev./ Vers.**
9.1	2	Assembly housing	XALD01	
9.2	1	Assembly housing for 2 Style 5 buttons	XALD02	
9.3	1	Three position selector switch	XB5AD33	
9.4	1	Signal lamp white LED	XB5AVB1	
9.5	1	Illuminated pushbutton with red LED 1 NC / 1 NO	XB5AW34B5	
9.6	3	Illuminated pushbutton with blue LED 1 NC	XB5AW36B5	
9.7	1	Indicator bank (red, green, blue, white)	XVBC	

Communication

Hardware-Components				
Pos.	**Qty.**	**Description**	**Part Number**	**Rev./ Vers.**
10.1	1	PC→STU655 Programming cable, USB to USB	XBTZG935	
10.2	1	STU655 →M238 connection cable, RJ45 to RJ45	VW3A8306R30	
10.3	1	PC→M238 Programming cable (optional)	TCSXCNAMUM3P	

Wireless Pushbutton

Hardware-Components				
Pos.	**Qty.**	**Description**	**Part Number**	**Rev./ Vers.**
11.1	1	Ready to use pack: wireless pushbutton & receiver	XB5RMA04	

Software Tools

Software-Components				
Pos.	**Qty.**	**Description**	**Part Number**	**Rev./ Vers.**
12.1	1	SoMachine (includes Vijeo Designer) on DVD, trial version	MSDCHNSFNV30	V3.0
12.2	1	Single user license for SoMachine	MSDCHNL•UA	

Component Protection Classes

Positioning Protection Class	Component	In Field, On Site			Cabinet		
					Front		Inside
		IP54	IP65	IP67	IP55	IP65	IP20
	Main Switch NSX						X
	Emergency Stop switch housing XALK		X				
	Preventa safety module XPSAC5121						X
	Preventa guard switch XCSPA792			x			
	Single/Double switch housing, complete		X				
	Control switch, 3 positions					X	
	Indicator buttons,		X				
	Buttons with LED + 1 switch, all colors						X
	Harmony Wireless pushbutton & receiver		X				X
	Labels 30 x 40,		X				
	Positions switch Universal		X				
	Contactor,						X
	Phaseo Power Supply 24 Vdc / 5 A						X
	Modicon M238 Logic controller						X
	TM2 I/O Expansion Modules						X
	Magelis STU655 HMI					X	X
	Lexium 32 Servo Drive						X
	BMH Servo Motor		X shaft end IP40				
	Altivar 312 Variable Speed Drive						X
	Altivar 12 Variable Speed Drive						X

Environmental Characteristics

NOTE: The equipment represented in the architecture(s) of this document has been rigorously tested to meet the individually specified environmental characteristics for operation and storage, and that information is available in the product catalogs. If your application requirements are extreme or otherwise do not appear to correspond to the catalog information, your local Schneider Electric Support will be eager to assist you in determining what is appropriate for your particular application needs.

Component Features

Components

Compact NSX main switch

Compact NSX rotary switch disconnections from 12 to 175 A are suitable for on-load making and breaking of resistive or mixed resistive and inductive circuits where frequent operation is required. They can also be used for direct switching of motors in utilization categories AC-3 and DC-3 specific to motors.

- 3-pole rotary switch disconnectors, 12 to 175 A
- Pad lockable operating handle (padlocks not supplied)
- Degree of protection IP65

Power Supply Phaseo: ABL8RPS24050

- 1 or 2-phase connection
- 100...120 Vac and 200...500 Vac input
- 24 Vdc output
- 5 A output
- Diagnostic relay
- Protected against overload and short circuits

Preventa Safety Module: XPSAC5121

Main technical characteristics:

For monitoring	Emergency Stop
Max. Category accord. EN 954-1	3
No. of safety circuits	3 N/O
No. of additional circuits	1 Solid-State
Indicators	2 LED
Power supply AC/DC	24 Vdc
Response time on input opening	< 100 ms
AC-15 breaking capacity	C300
DC-13 breaking capacity	24 Vdc / 2 A - L/R 50ms
Minimum voltage and current	17 V / 10 mA
Dimensions (mm)	114 x 22.5 x 99
Connection	Captive screw-clamp terminals
Degree of protection	IP20 (terminals) IP40 (casing)

Safety modules XPSAC are used for monitoring Emergency Stop circuits conforming to standards EN ISO 13850 and EN 60204-1 and also meet the safety requirements for the electrical monitoring of switches in protection devices conforming to standard EN 1088 ; ISO 14119. They provide protection for both the machine operator and the machine by immediately stopping the dangerous movement on receipt of a stop instruction from the operator, or on detection of a fault in the safety circuit itself.

Modicon M238 Logic controller: TM238LDD24DT

The M238 is powered with 24 Vdc, offers:

- 14 x 24 Vdc inputs including 8 fast inputs, dedicated to special functions such as HSC high-speed counters
- 10 x 24 Vdc solid state outputs including 4 fast outputs, dedicated to special functions such as counting, PWM and PTO
- A RS 232/RS 485 serial link (ASCII or Modbus protocol).
- A Modbus RS 485 serial link mainly dedicated to connection of a Human/Machine interface terminal (link providing a 5 V power supply for a Magelis Small Panel XBT NP00/R400/RT500)
- Expand the I/O count by adding up to 7 expansion modules. The following modules are available:
    - Discrete TM2DDI/DDO/DMM/DRA
    - Analog TM2AMI/ALM/ARI/AMO/AVO/AMM
    - High-speed counter TM200 HSC210DT/DF
    - AS-Interface Master TWDNOI10M3 (max. 2)

Magelis Display Terminal: HMISTU655

Magelis STU Small Panel

- High-definition TFT QVGA with 24 Vdc power supply
- 64kK colors
- Serial port RJ45 RS485/232 multiprotocol interface
- 10/100 BaseT RJ45 Ethernet port interface
- 1 mini USB Device + 1 USB Host 2.0 interface
- Temperature range: 0..+ 50 °C
- Certificates: UL, CE, cULus, C-Tick

Altivar 12 Variable Speed Drive: ATV12H037M2

- 100 Vac to 120 Vac 1- phase, 0.18 kW to 0.75 kW
- 200 Vac to 240 Vac 1-phase, 0.18 kW to 2.2 kW
- 200 Vac to 240 Vac 3-phase, 0.18 kW to 4 kW
- Integrated EMC Filter
- Temperature Range: - 10..+ 50°C
- Speed range 1 to 20 (0...200 Hz)
- Speed control using Flow Vector Control
- Drive and motor Protection
- Compact profile, In-row mounting on a DIN rail

Altivar 312 Variable Speed Drive

The Altivar 312 drive is a variable speed drive for 3-phase squirrel cage asynchronous motors. The Altivar 312 is robust, compact, easy to use and conforms to EN 50190, IEC/EN 61800-2, IEC/EN 61800-3 standards UL/CSA certification and to CE marking.

Altivar 312 drives communicate on Modbus and CANopen industrial buses. These two protocols are integrated as standard.

Multiple units can be mounted side by side to save space.

Drives are available for motor ratings between 0.18 kW and 15 kW, with four types of power supply:

- 200 Vac to 240 Vac 1- phase, 0.18 kW to 2.2 kW
- 200 Vac to 240 Vac 3-phase, 0.18 kW to 15 kW
- 380 Vac to 500 Vac 3-phase, 0.37 kW to 15 kW
- 525 Vac to 600 Vac 3-phase, 0.75 kW to 15 kW

Lexium 32 servo drive

- Voltage range:
  1-phase 100 – 120 Vac or 200 – 240 Vac
  3-phase 200 – 240 Vac or 380 – 480 Vac
- Power: 0.4 to 6 kW
- Rated torque: 0.5 to 36 Nm
- Rated speed: 1500 to 8000 RPM
- The compact design allows for space-saving installation of the drive in control cabinets or machines.
- Features the "Power Removal" (Safe Stop) functional safety function, which prevents the motor from being started accidentally. Category 3 with machine standard EN 954-1
- Lexium 32 servo amplifiers are fitted with a brake resistor as standard (an external brake resistor is optional)
- Quick control loop scan time: 62.5 µs for current control loop, 250 µs for speed control loop and 250 µs for position control loop
- Operating modes: Point-to-point positioning (relative and absolute), electronic gears, speed profile, speed control and manual operation for straightforward setup.
- Control interfaces:
  CANopen, Modbus or Profibus DP
  Analog reference inputs with ± 10 Vdc Logic inputs and outputs

SoMachine OEM Machine Programming Software: MSDCHNSFNV30

SoMachine is the OEM solution software for developing, configuring and commissioning the entire machine in a single software environment, including logic, motion control, HMI and related network automation functions.

SoMachine allows you to program and commission all the elements in Schneider Electric's Flexible and Scalable Control platform, the comprehensive solution-oriented offer for OEMs, which helps you achieve the most optimized control solution for each machine's requirements.

Flexible and Scalable Control platforms include:

Controllers:

HMI controllers:
- Magelis XBTGC HMI controller
- Magelis XBTGT HMI controller
- Magelis XBTGK HMI controller

Logic controllers:
- Modicon M238 Logic controller
- Modicon M258 Logic controller

Motion controller
- Modicon LMC058 Motion controller

Drive controller:
- Altivar ATV-IMC Drive controller

HMI:

HMI Magelis graphic panels:
- XBTGT
- XBTGK
- XBTGH
- HMISTU /HMISTO

SoMachine is a professional, efficient, and open software solution integrating Vijeo Designer.
It integrates also the configuring and commissioning tool for motion control devices.

It features all IEC 61131-3 languages, integrated field bus configurators, expert diagnostics and debugging, as well as outstanding capabilities for maintenance and visualization.

SoMachine integrates tested, validated, documented and supported expert application libraries dedicated to Packaging, Hoisting and Conveying applications.

SoMachine provides you:
- One software package
- One project file
- One cable connection
- One download operation

Contact

Homepage	http://www.schneider-electric.com

As standards, specifications and designs change from time to time, please ask for confirmation of the information given in this publication.